WORLD'S POULTRY SCIENCE JOURNAL

JANUARY - MARCH

1952

Official Organ of the

WORLD'S POULTRY SCIENCE ASSOCIATION

Volume 8 - Number 1

Incorporated in manufactured feeds, low-cost

MEGASUL

can save millions of chicks from coccidiosis!

Poultrymen lose fewer chicks to coccidiosis — manufacturers increase the efficiency and enhance the reputations of their feeds! These are the results when manufacturers incorporate MEGASUL* Nitrophenide 25% in Extracted Soybean Oil Meal Mixture *Lederle* in their feeds.**

In a feed, this highly effective drug, the lowest in cost in its field:

1. **Saves chicks formerly lost or stunted by coccidiosis.**
2. **Is effective in all sections of the country and under all climatic conditions.**
3. **It has no ill effect on egg production, hatchability or fertility.**
4. **By controlling coccidiosis, it promotes more uniform growth.**
5. **Brings birds to early market weights.**
6. **Enables birds to assimilate feed better and produce more marketable weight per pound of feed consumed.**

MEGASUL Nitrophenide 25% *Lederle* is a low-priced drug for prevention of outbreaks of cecal and intestinal coccidiosis by continuous low-level feeding in poultry feeds. If an outbreak of coccidiosis is to be controlled, a feed containing a higher level of MEGASUL is fed intermittently for a few days.

MEGASUL is relatively low in toxicity. This permits its use at flexible levels in manufactured feeds for both prevention and control of outbreaks of coccidiosis in all seasons and under all climatic conditions.

***Reg. U. S. Pat. Off.** ****U. S. Pat. No. 2,510,456.**

Animal Feed Department

LEDERLE LABORATORIES DIVISION

AMERICAN CYANAMID COMPANY

30 Rockefeller Plaza New York 20, N. Y.

WORLD'S POULTRY SCIENCE JOURNAL

Volume 8 January-March Number 1

Editor

GUSTAVE F. HEUSER

Publication Committee

W. A. MAW, *Chairman*, Canada
C. F. ANDERSON, Australia
V. S. ASMUNDSON, U.S.A.
E. ENGLER, Switzerland
DR. FANGAUF, Germany
F. M. FRONDA, Philippine Is.
A. M. GERICKE, South Africa
E. T. HALNAN, England
N. ISLAM, Pakistan
LAURA KAUFMAN, Poland
J. W. KINGHORNE, U.S.A.
F. LIEVENS, BELGIUM
N. OLSSON, Sweden
C. L. MORGAN, U.S.A.
H. N. RAO, India
W. C. THOMPSON, U.S.A.
C. W. UPP, U.S.A.
D. URI, Palestine

Advertising Committee

O. B. KENT, *Chairman*, U.S.A.
W. P. BLOUNT, *Vice-Chairman*, England
F. BRAY, Canada
N. C. DeRYCKE, Belgium
H. EBBELL, Switzerland
A. D. GOLDHAFT, U.S.A.
R. T. PARKHURST, U.S.A.
L. PASSEBON, France
A. G. PHILIPS, U.S.A.

Published quarterly by the

WORLD'S POULTRY SCIENCE ASSOCIATION

Cornell University, Ithaca, N. Y., U.S.A.

Membership dues $3.00 a year of which $2.50 is for a year's subscription to the "World's Poultry Science Journal." Subscription rate, $3.50 a year. Advertising rates upon application.

Entered as second class matter May 31, 1945 at the Post Office at Ithaca, N. Y., under the act of March 3, 1879.

CONTENTS

Message from President Alex Wiltzer 4

A comparison of corn, brown rice and wheat in chick rations
A. L. Palofox and M. M. Rosenberg 6

Poultry Breeding
I. M. Lerner 13

Poultry and egg situation in Argentina 17

Comparative feed requirements of meat chickens
H. J. Almquist 24

Utilization of feed by poultry
W. W. Cravens 30

Training 4-H egg specialists
H. E. Cushman 33

Review of poultry publications 35

Financial statement for 1951 74

OFFICERS OF THE WORLD'S POULTRY SCIENCE ASSOCIATION

President, Mr. Alex Wiltzer (France)

Honorary Past Presidents

Professor A. Ghigi (Italy)
Professor J. E. Rice (U.S.A.)
Mr. W. A. Kock (Denmark)
Mr. W. D. Termohlen (U.S.A.)

Vice Presidents

Dr. R. Coles (England)
Mr. J. W. Kinghorne (U.S.A.)
Mr. C. S. Th. Van Gink, (Holland)
Mr. H. Engler (Switzerland)
Dr. F. Lievens (Belgium)

Treasurer and Assistant-Secretary

Dr. G. F. Heuser (United States of America)

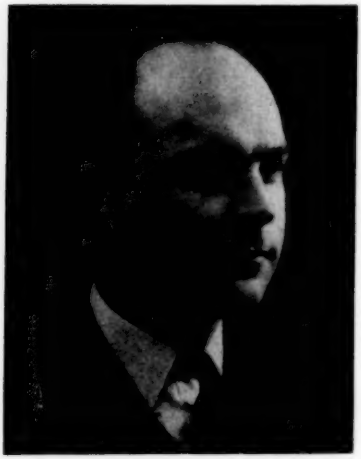
Secretary and Assistant-Treasurer

Major Ian Macdougall (England)

Members of Council:

Australia: Mr. R. W. Kurrle
Belgium: Mr. J. Van Ingelgem and Professor R. Willems
Canada: Professor J. R. Cavers and Mr. G. L. Landon
Denmark: Mr. D. Philpott and Mr. J. Traberg
Eire: Mr. D. Philpott
England: Mr. D. J. G. Black, Dr. R. F. Gordon, Mr. E. T. Halnan, Mr. C. Horton-Smith, Dr. S. K. Kon, Mr. W. Marshall, and Mr. K. Wilson.
Finland: Professor N. Westermarck
France: Mr. P. Waroquiez
Germany: Dr. A. von Burgsdorff-Garath and Dr. H. Havermann
Holland: Professor L. de Blieck and Mr. J. G. Tukker
India: Mr. S. G. Iyer
Israel: Mr. A. Livshutz
Italy: Professor Anita Vecchi
New Zealand: Mr. J. G. Kissling
Northern Ireland: Dr. J. G. Rhynehart
Norway: Mr. L. Svendsen
Pakistan: Mr. Nurul Islam
Scotland: Miss M. M. MacLeod and Mr. J. E. Wilson
South Africa: Professor A. M. Gericke
Spain: Mr. Luis Latorre
Sweden: Mr. E. Haeggblom and Professor N. Olsson
Switzerland: Mr. H. Ebbell and Mr. H. Kleb
U.S.A.: Mr. H. H. Alp, Dr. C. D. Carpenter, Dr. E. M. Funk, Mr. R. R. Hannas, Mr. R. M. Hanson, Dr. R. J. G. Jaap, Dr. M. A. Jull, Dr. O. B. Kent, Mr. M. C. Small and Mr. J. D. Sykes.

MESSAGE FROM PRESIDENT ALEX WILTZER TO THE MEMBERS OF THE WORLD'S POULTRY SCIENCE ASSOCIATION



It is a very great pleasure for me to have, for the first time, the opportunity to speak to all the Members of the World's Poultry Science Association, the people who have been fighting for so many years for the continual progress of our industry and the prosperity of our Organization.

It is for me a very agreeable duty to express, in the name of all of you, my warmest thanks to my friend, Honorary Past President W. D. Termohlen, who has led the World's Poultry Science Association with so much energy during the past few years.

I also want to give my special thanks, to my two next co-operators and friends Doctor Heuser and Major Ian Macdougall for all that they have done for many years toward the growth and prosperity of the World's Poultry Science Association.

To know that also for the future I may count upon the full co-operation and friendship of these persons as well as of all the other Members of the Council is really a great satisfaction and relief to me.

The 9th World's Poultry Congress, which I had the pleasure to organize in Paris last year—and on this occasion I would like to return my warmest thanks to all of those who have, from near and far, contributed to the success of the Congress—has given us the proof, of which we all may be proud, that the World's Poultry Science Association is one of the greatest organizations of this kind. Our Minister of Agriculture has informed me in this regard that seldom had he attended a Congress like this one which brought together such a great number of delegates coming from so many different countries.

In spite of this success of which the World's Poultry Science Association can be proud I must note that several things could still have been done better and more perfect.

It is a curious observation about man that every thing which he is doing could be done in still a better manner, and this fact indicates to us the way for a new and greater task.

I have, in the beginning of my Presidency, the profound desire to continue in the best form—in co-operation with all my friends—the admirable work which my friend Termohlen has done.

The first aim to which we will give our efforts will be the organization of the 10th World's Poultry Congress, because it is our wish that this one shall be more perfect and more important than the last one.

It is not necessary to assure you that I shall give my full and absolute support as well as that of the World's Poultry Science Association to the country which will take over the responsibility for the 10th World's Poultry Congress.

Without proposing a programme I should like to state with great satisfaction that the World's Poultry Science Association includes members from the greatest part of all countries of the world. Nevertheless there are yet not included too many Poultry Organizations and poultry breeders. Therefore, it will be one of my essential objects—with the help of all of you who are already Members of our Association and who will give me your kind support—to constantly obtain new friends and members for this great organization.

At the beginning of this new year I should like to wish you, my dear friends, great happiness for yourself and your families. Especially I wish that all of you will find contentment and satisfaction in your breedings. It is also my warm desire that our scientists and all those, who constantly try in an unselfish work to find more perfect methods, may prepare new ways for the progress of our great Poultry Industry.

May all these efforts be useful to our Poultry breeding and to the World's Poultry Science Association, may they strengthen these and grant them, day by day, a greater and more important place in the whole world. This is the profoundest wish of your President.

A COMPARISON OF CORN, BROWN RICE, AND WHEAT IN CHICK RATIONS*

A. L. PALAFOX and M. M. ROSENBERG
Department of Poultry Husbandry, College of Agriculture
University of Hawaii, Honolulu, Hawaii

INTRODUCTION

Cereal grains are at present the primary source of carbohydrates used in poultry rations. Among them, corn and wheat are utilized to the greatest extent. Rice is also a good source of carbohydrates, but it is fed only in restricted areas of the world. Indeed, ready-mixed feed is being shipped to many tropical areas where rice is readily available, and where rice is not included in the feed. If locally produced rice can be included in poultry feed by virtue of being cheap and plentiful, it would be more economical to utilize this grain instead of importing others. Little has been known, however, concerning the comparative values of corn, rice, and wheat. It seemed worthwhile, therefore, to determine the replacement value of rice for corn and/or wheat.

REVIEW OF LITERATURE

Cereal grains for poultry have been used to a great extent. Payne (1934), Maw (1939), and Maw *et al.* (1939) have used corn in chick diets with good results. Poley *et al.* (1940) and Whitson *et al.* (1945) found that in most cases wheat proved superior to corn for growth and efficiency. On the other hand, Scott *et al.* (1947) noted that corn was slightly superior to wheat in feed efficiency. Biely *et al.* (1951) showed that substitution of wheat for corn on a pound for pound basis did not alter the growth-promoting value of the ration. Ewing (1947) reported that rough rice may be substituted economically for yellow corn in layer rations, and ground rice may be included to 35 percent of the diet. McCord *et al.* (1942) and Nelson and Palmer (1942) showed that rice polishings are especially high in nicotinic acid and thiamin chloride.

MATERIALS AND METHODS

Experiment I, consisting of two trials, was conducted with 234 straight-run day-old New Hampshire chicks. The birds were weighed and randomized into different lots of 20 chicks each in trial 1 and 19 in trial 2. Three rations containing 63 percent corn, brown rice, or wheat as the primary source of carbohydrates were fed to duplicate lots. The chicks were brooded in electrically heated battery brooders.

* Published with the approval of the Director of the Hawaii Agricultural Experiment Station as Technical Paper No. 247.

Experiment II, consisting of three trials, was conducted by feeding 73 percent corn, brown rice, or wheat, and in these trials a U. S. Mainland-style ration (S49) was included for comparison. In trials 3 and 4 each ration was fed to a group of 20 chicks each. Trial 5 was conducted in exactly the same manner as the preceding tests. In addition, however, four groups of chicks were also brooded on litter. Unfortunately, it was necessary to discontinue the group fed rice because the chicks ate wood shavings and became unthrifty. Data were taken biweekly on body weight and feed consumption.

The composition of diets fed in the five trials may be seen in Table 1.

TABLE I

Composition of Diets

Experiment number	I			II			
Ration number	35	38	39	69	70	71	S49
Ground brown rice*		63.0			73.0		
Ground wheat			63.0			73.0	20.0
Ground yellow corn	63.0			73.0			30.0
Ground oats							8.25
Herring meal	25.0	25.0	25.0	20.0	20.0	20.0	5.0
Meat scrap	5.0	5.0	5.0				5.0
Soybean oil meal							26.0
Dehydrated alfalfa meal				5.0	5.0	5.0	5.0
Koa haole	5.0	5.0	5.0				
Ground oyster shell				1.5	1.5	1.5	.25
Deflourophos	1.5	1.5	1.5				
Salt	.5	.5	.5	.5	.5	.5	.5
Manganese sulfate, gm.	7.5	7.5	7.5	15.0	15.0	15.0	10.0
Delsterol, gm.†	30.0	30.0	30.0	30.0	30.0	30.0	15.0
Choline chloride (25%), gm.	250.0	250.0	250.0	200.0	200.0	200.0	125.0
Aurofac, gm.‡	300.0	300.0	300.0	175.0	175.0	175.0	
Fortafeed, gm.**	50.0	50.0	50.0				
Fish oil (934 A), gm.	35.0	35.0	35.0				
Tri-calcium phosphate, gm.	125.0	125.0	125.0				
Thiamin, mg.	180.0	180.0	180.0				
Riboflavin, mg.				160.0	160.0	160.0	160.0
Nicotinic acid, mg.	800.0	800.0	800.0	900.0	900.0	900.0	
Calcium pantothenate, mg.				400.0	400.0	400.0	

* Unless otherwise specified the unit of measure is pound(s).

† Guaranteed minimum potency of vitamin D = 2000 AOAC/gm.

‡ Lederle: guaranteed minimum potency of 1.8 mg. vitamin B_{12} and 1.8 gm. aureomycin.

**Lederle: guaranteed equivalent of 2000 mg. each of riboflavin, calcium pantothenate, and niacin per pound.

RESULTS

At 6 weeks of age, the males in both trials of Experiment I averaged 745.5, 749.3, and 715.8 grams, respectively, on rations 35 (corn), 38 (brown rice), and 39 (wheat). The females weighed 615.5, 657.8, and 605.3 grams, respectively. The analysis of variance which may be seen in Table 3 showed that there was a significant difference between the groups fed

TABLE 2

Summary of final 6-Week Body Weight and Feed Efficiency of Experiment I

Trial	Sex	Body Weight (grams) Ration 35 63% corn	Ration 38 63% rice	Ration 39 63% wheat	x
1	Male	747.5	736.0	688.0	723.8
	Female	650.0	677.5	599.0	642.2
2	Male	743.5	762.5	743.5	749.8
	Female	581.0	638.0	611.5	610.2
x	Male	745.5	749.3	715.8	736.8
	Female	615.5	657.8	605.3	626.2
x of ration		681.0	703.5	661.0	
Feed/gain		2.16	2.02	2.16	

Least significant differences:
Between rations = 33.2
Between sexes = 27.1
Between feed efficiencies = 0.21

the three grains. The least significant difference between the means showed that 63 percent wheat was not as good as either 63 percent corn or 63 percent brown rice when fed singly, and there was no significant difference between the corn and brown rice diets. Furthermore, there was no significant difference in feed efficiency between rations or between replicates and trials.

TABLE 3

Analysis of Variance Using Final 6-Week Weight as Criteria for Measurement of Difference (Series 1)

Source	Degrees of Freedom	Sum of Squares	Mean Square	F
Total	23	100,446.00		
Rations	2	7,408.00	3,704.00	3.70*
Sex	1	73,482.66	73,482.66	73.35**
Replicate	1	1,176.00	1,176.00	1.17
Trial	1	54.00	54.00	.05
Error	18	18,325.34	1,001.81	

* Significant at 5 percent.
** Highly significant.

The results of Experiment II may be seen in Table 4. At 6 weeks of age the mean body weights of the males in trials 3, 4 and 5 were 816, 799, and 807 grams, respectively, for rations 69 (corn), 70 (brown rice), and 71 (wheat), whereas the females averaged 684, 671, and 665 grams, in the same order. In these trials there was a mean male weight range of only 17 grams between the lightest and heaviest groups. The range among the female groups was only 19 grams. Upon analysis, there was no significant difference between the

TABLE 4

Average 6-Week Weight and Feed Efficiency of Chicks Fed 73 Percent Ground Corn, Brown Rice, and Wheat

Supplement	Ration No.	Male Weight (grams)				Female Weight (grams)					Feed Efficiency
		Trial 3	Trial 4	Trial 5	x Males	Trial 3	Trial 4	Trial 5	x Females	x Males and Females	
Standard	49	701	751	780	744	655	619	686	653	699	**2.16**
Corn	69	793	799	857	816	655	678	720	684	750	2.09
Rice	70	749	793	854	799	619	692	703	671	735	2.03
Wheat	71	821	732	867	807	659	630	705	665	736	2.13

Least significant Differences:
Between sexes = 24
Between rations = 34
Between feed efficiencies = 0.34

groups fed the single grains at the 73 percent level. Further analysis revealed a significant difference between the three trials, however.

Table 5 shows the result of trial 5, Experiment II. The males brooded in batteries weighed 857, 854, and 867 grams, whereas the females averaged 720, 703, and 705 grams, respectively, for the 73 percent corn, 73 percent brown rice, and 73 percent wheat diets. The males brooded on litter weighed 785 and 773 grams, whereas the females averaged 700 and 651 grams, respectively, for 73 percent corn and 73 percent wheat. The birds brooded in batteries were consistently heavier than those brooded on litter, and they utilized their feed more efficiently. The units of feed per unit of gain required by birds reared in batteries was 1.96, 199, and 1.98, respectively, for the birds fed corn, brown rice, and wheat. The birds on litter averaged 2.06 and 2.07, respectively, when fed the corn and wheat rations. While there was but one perotic bird among the 60 reared on litter, there were five out of 80 chicks reared in batteries.

In trials 3, 4, and 5 the chicks fed the standard mainland-style ration were consistently and significantly lighter than the groups fed 73 percent corn, brown rice, or wheat. Thus the standard ration was not as good as the simplified rations in which the three grains

TABLE 5

Average 6-Week Weight and Feed Efficiency of Chicks Brooded in Batteries and on Litter

Ration	Body Weight (grams)				x of Rations	Feed/Gain	
	Batteries		Floor				
	Males	Females	Males	Females		Batteries	Floor
S49	780	686	734	599	699.8	2.02	2.87
73% corn	857	720	785	700	765.5	1.96	2.06
73% wheat	867	705	773	651	749.0	1.98	2.27
x of treatment	769.2		-707.0				

Least significant differences:
Between rations = 31.5
Between treatments = 25.0

were fed singly. The chicks fed the mainland-style diet weighed on the average 36 grams less than the lightest group fed corn, brown rice, or wheat at 73 percent of total ration.

DISCUSSION

It has been shown that chicks fed wheat at the rate of 63 percent of total ration were lighter at 6 weeks of age than those fed the same amount of either corn or brown rice. The chicks fed brown rice were somewhat heavier than those fed corn, the difference being more apparent among the females. Upon analysis the difference between rations was statistically significant; but only the birds fed wheat proved to be significantly lighter than the rice-fed groups. Feed efficiency was not significantly different between rations. The difference between any two rations did not exceed the least significant difference of 0.23. Thus, the three cereal rations were equally good when judged by the amount of feed required per unit of gain.

In Expriment II, when corn, brown rice, or wheat were fed singly at the 73 percent level, there was no significant difference among them in the final 6-week weights. This result is at variance with that of Experiment I in that wheat was significantly inferior to brown rice when either rice or wheat was fed singly at 63 percent of the chicks' mash. Since the caloric value of rice is higher than that of wheat, there may have been insufficient carbohydrates when wheat was fed alone at 63 percent of the ration to provide the optimum amount of energy needed by the chick. However, when wheat was fed at 73 percent of the diet, additional calories were then provided for optimum growth. The extra energy supplied by corn and rice at the 73 percent level did not proportionately increase

growth efficiency so that there was no significant difference in final 6-week weights between the three grains. Seventy-three percent corn, brown rice, or wheat were equally good in promoting growth. After this study was completed, a report by Biely *et al.* (1951) showed that wheat could be substituted for corn on a pound for pound basis in the Connecticut broiler ration. They used 70 percent of either corn or wheat.

The mainland-style ration used in this study was significantly inferior to any of the diets containing 73 percent corn, brown rice, or wheat. It is obvious from the above results that corn, brown rice, and wheat may be used interchangeably as a single source of carbohydrates for growing chicks. The multiple sources of carbohydrates that are found in mainland-style standard rations are not essential if the proper amount in combination with the other nutrients is provided to meet the chicks' needs for metabolism and optimum growth.

SUMMARY

Four hundred and seventy-four straight-run day-old chicks were utilized to assay biologically the comparative efficiencies of corn, brown rice, and wheat when each was fed singly as the primary source of carbohydrates in a chick ration. It was observed that brown rice, when fed at 63 percent of total ration, was significantly better than wheat but not corn when measured by growth rate to 6 weeks of age. However, when these grains were fed singly at a concentration of 73 percent of total diet, the differences in growth rate among the groups were not significant. Less feed per unit of gain was required by the rice-fed groups. This result was consistent in two experiments involving a total of five trials. It was also found that simplified, high-energy rations containing corn, brown rice, or wheat promoted growth rates that were significantly superior to those supported by a standard chick starter ration.

The incidence of perosis was higher among battery-reared birds fed the simplified rations than among those reared on litter. In this investigation the growth rate of chicks started in battery brooders was significantly better than that of the floor-reared chicks.

REFERENCES

Biely, J., B. E. March, G. L. Inkin, and G. T. Eedy, 1951. Wheat versus corn in the Connecticut broiler ration. *Poultry Sci. 30:* 593-598.

Ewing, W. Ray, 1947. *Poultry Nutrition.* 3rd edition, pp. 350-351. W. Ray Ewing, Publisher, South Pasadena.

Maw, W. A., 1939. Cereals in the fattening ration. *Proceedings, Seventh World's Poultry Congress*, pp. 177-178.

Maw, W. A., and A. J. G. Maw, 1939. Cereals in fattening ration. II. Their comparative values in fattening broilers. *Sci. Agr. 19:* 602-607.

McCord, W. M., and F. G. Brazda, 1942. Vitamin content of rice polishings. *Federation Proceedings II, 29th Annual Meeting of Federation of Am. Soc. for Exp. Biol. 1(1)*, March 16.

Nelson, J. W., and L. S. Palmer, 1942. The thiamin, riboflavin, nicotinic acid and pantothenic acid contents of wild rice. *Cereal Chem. 19:* 450.

Payne, L. F., 1934. The comparative value of sorghum grain, corn and wheat as poultry feed. *Kansas Agr. Expt. Sta. Bull. 268.*

Poley, W. E., A. L. Moxon, W. O. Wilson, and R. L. Doleek, 1940. Wheat and barley in the diet on the physical and chemical composition of fryers and roasters. *J. Agr. Res. 61:* 161-178.

Scott, H. M., and L. D. Matterson, and E. P. Singsen, 1947. Nutritional factors influencing growth and efficiency of feed utilization. I. The effect of the source of carbohydrate. *Poultry Sci. 26:* 554.

Whitson, D., J. C. Hammond, H. W. Titus, and H. R. Bird, 1945. The use of soybean meal in the diet of growing chicks. II. Effect of different grains. *Poultry Sci. 24:* 408.

CUBAN EGG MARKETING DEVELOPMENTS

With the view of developing a sounder poultry industry in Cuba, especially with respect to the production and marketing of eggs, the Cuban Minister of Agriculture issued Decree 4768 (published in *Official Gazette* 267, November 14, 1951). This Decree authorizes the establishment of certified poultry farms for the production of quality-graded eggs for local consumption.

During recent years Cuba has become more and more dependent upon imported eggs to satisfy local requirements, particularly in the Havana area. Commercial poultrymen have concentrated upon the production of broilers rather than eggs. The ceiling price on eggs, currently 72 cents retail per dozen, has discouraged investment in egg production.

Decree 4768 establishes 3 grades for hen eggs, based upon both size and quality. It is assumed that there will be some modification in the ceiling price of eggs sold by official certified poultry farms, as a means of encouraging the production of high grade eggs. In January of each year the Cuban Ministry of Agriculture will publish the list of these certified farms, based upon the qualifications set forth in the Decree. (Foreign Crops and Markets, U.S.D.A.)

POULTRY BREEDING

I. MICHAEL LERNER
University of California College of Agriculture, Berkeley, Calif., U.S.A.

Most breeders of chickens who start with average or below-average commercial flocks have little difficulty in obtaining improvement by selection of economic characters.

The speed with which improvement is obtained will be determined to a considerable extent by the method used—mass selection, family testing, selection by index, or some other plan. Intelligent application of even the least efficient genetic practices may be expected, in most cases, to improve the selected traits.

It is after a more or less successful period of such selection that real difficulties may arise. Following a number of generations of rising production averages, body size, disease resistance—or whatever selection is directed towards—improvement rates usually slow down and eventually may cease altogether. In such cases the breeder is still applying, so far as he knows, a reasonable selection pressure. His stock may still be nearly as variable as it was at the beginning of his improvement efforts. The level of performance for the selected trait may still be below averages reported in other flocks. Yet despite all of these conditions progress seems to have stopped.

The cessation or slowing down of improvement is a problem of great importance. Discovery of efficient methods of overcoming this difficulty requires an understanding of the basic reasons for the slackening of gains in long-term selection programs.

The Division of Poultry Husbandry has several subprojects dealing with this aspect of breeding. One of these concerns itself with continued selection for increased shank length. This character was used because shank length is a good measurement of body size—hence of economic importance—and is a relatively simple trait from the biological viewpoint. A recent analysis of data from this experiment has thrown some significant light on the problem of cessation of gains from selection.

The mechanism underlying cessation of selection progress in this case may not account for all other similar cases, but at least one such mechanism was found.

A White Leghorn flock in which mature pullets had an average shank length of 9.69 centimeters—cm—was subjected to selection for an increase in this character. The average

length of shank in the succeeding generations of the experimental flock gradually rose as follows:

Generation	*Shank Length* *cm*
0	9.62
1	9.92
2	9.92
3	10.20
4	10.29
5	10.46
6	10.73
7	10.84

Concurrently a control population was carried along without conscious selection for length of shank. In this check group the shank length varied somewhat from year to year, but never rose above 9.89 cm—generation 10—dropping as low as 9.37 cm at one stage—generation three.

Clearly up to the seventh generation, continued progress in the objective sought was being obtained in the experimental flock. In the following four generations, however, at least a temporary cessation of improvement occurred:

Generation	*Shank Length* *cm*
8	10.71
9	10.73
10	10.96
11	10.78

The test provided a clue to the reasons for this cessation. As shank length increased a drop occurred in the reproductive capacity, involving any or all of the factors determining the number of offspring a bird produces: egg number, fertility, hatchability, and chick viability. For instance, in generation two, 4.67 mature pullets were obtained from each selected dam in a four-week hatching period; in generation nine this number dropped to 1.57.

Longer-shanked birds thus seem to produce fewer offspring. At first sight this relationship seems to be a result of inbreeding. The important fact, however, was that in the later generations—but not in the earlier ones—longer-shanked birds produced fewer daughters than their shorter-shanked flockmates of the same generation and degree of inbreeding. Independently of inbreeding, a negative correlation must have arisen between reproductive capacity and shank length.

The average bird is a well-balanced organism with an optimum combination of different properties for reproduction. If a single property is selected towards an extreme con-

dition, a certain amount of tolerance permits some gains to occur. But an attempt to push beyond a limit interferes with the balance, leading to poor reproductive performance. The breeder continues exercising selection pressure, but since his better birds—from the standpoint of the selected trait—do not breed as well as the poorer ones, this selection pressure is counter-balanced to such an extent that little further progress is obtained.

There is some indication that constant maintenance of selection pressure will permit the flock to find a new favorable balance. Gradually other biological properties of the bird will adjust themselves to the extreme type—of shank length in this experiment—and further improvement with some restoration of reproductive capacity may be obtained. This is shown in the last series of measurements:

Generation	*Shank Length cm*
12	11.10

The control of this generation stayed at 9.58 cm, almost identical with the original population. The number of mature pullets obtained from each dam, however, increased from the low value of 1.57 to over three. Further generations of selection will be studied.

If this interpretation of the situation is correct sufficient patience may eventually permit the breeder to break through the ceiling for a given trait. This, however, is not a satisfactory solution of the problem. Methods of speeding up the process of readjustment between the extreme expression of a selected character and the other factors in a bird's make-up must be sought. There are some indications that the theory advanced from this study may be applicable beyond the particular trait studied here. It is, however, likely that the more complex is the selected character, the more difficult and the longer is the process of finding new balanced combinations. The need for artificial techniques of hastening readjustment is therefore greater for such characters as egg production than for the simpler one of shank length.—California Agriculture.

TO WASH OR NOT TO WASH EGGS

Eggs will get dirty, even in the best regulated poultry operations. They always have and still do. Producers have long cleaned their eggs—some by washing, some dry cleaning, some by a "lick and a promise." For years washing of eggs was frowned upon. Recently this has become acceptable under some conditions. Our knowledge of how to clean them has improved, but it is not yet fool proof.

One can show many examples of successful washing operations but there are many examples of tragic failure and loss traceable to washing. Let's face facts. Certain physical characteristics of an egg must be considered. First, the shell is porous. Second, the egg will feed bacteria and mold. Third, the contents and shell expand and contract under changing temperatures at different rates, developing pressure or suction to aid in the passage of air, water, or anything carried by either of these through the pores of the shell. Other characteristics are involved, but these are enough for now.

Other pertinent facts concerning "bugs" that cause deterioration are: They are present almost everywhere. Their natural home is the soil. They thrive in and are carried by moisture. They thrive at so-called normal temperatures (70° to 100°F.). They can be destroyed by heat (pasteurization) and by chemical bactericides.

Handling of eggs should be such that insofar as possible growth and movement of bacteria is prevented. Improper washing can provide the means for both movement and growth as well as infection. The quality reputation of our Northeastern eggs is at stake. Many handlers are fearful of them, especially if storage for even a short hold is needed. Make it a rule that if you can't or won't wash eggs properly—DON'T DO IT. Dry cleaning has fewer dangers. Here are a few suggestions if you must wash:

1. Wash only the dirty eggs. Clean eggs, produced clean and kept clean are still the most satisfactory.
2. Clean eggs as soon as possible after they become soiled.
3. Washing water must be hotter than the eggs. Temperature should be 120° to 140° for not over 3 minutes for submersion, and 165° to 180° for not over 15 to 30 seconds for dip or spray. The hotter the water, the shorter the time before they cook.
4. Washing water must be clean. Detergents as such are not bactericides. A good bactericide can help considerably. Beware of detergents that remain on the egg—they should be rinsed off. Health officials frown on residual detergent material as "adulteration."
5. Washed eggs should be dried promptly.
6. Get the advice of your extension service on cleaning eggs.

BUT—*IF YOU CAN'T OR WON'T WASH EGGS THE RIGHT WAY—DON'T DO IT.* (Northeastern Poultry Producers Council)

POULTRY AND EGG SITUATION IN ARGENTINA[1]

Egg production in Argentina during the 1950-51 laying season (August-July) is roughly estimated near 240 million dozen, approximately 10 percent above the previous year. Increased numbers of laying hens, sufficient feed supplies, and good prices to farmers for eggs, gave rise to a generally large output. Favorable fall weather encouraged a relatively large lay late in the season. Fresh eggs entered Buenos Aires and other central markets during March, April, and May of 1951 in larger than usual quantities.

Prospects for production of eggs in principal producing zones during the season just beginning indicate an increase over 1950-51 production. The past season was encouraging to poultrymen. Egg prices held up strongly through most of last year and were generally quite satisfactory. Grain crops in the principal egg producing regions (Provinces of Buenos Aires and Entre Rios) have resulted in adequate feed for farm flocks. Drought conditions in Sante Fe and Cordoba have been somewhat limiting late in the season.

Although little is known of the size of the national flock or even of the number of birds producing eggs in the area which supplies the major consuming centers, chicken numbers for this laying season are estimated at about 50 million birds of which 37 million are thought to be hens. The major concerns purchasing eggs and poultry have almost no idea of the supply of poultry or eggs which will be available to them in a production season.

The twelve small commercial hatcheries in the country have contracted for as many chicks as their supplies of hatching eggs will permit and chicken breeding farms have sold all their pullets for replacements at good prices.

The laying season begins in August and usually is at the peak in October. By February the movement of eggs out of storage begins to supplement the late season production. Eggs stored during the flush season are usually all moved out by July. Shell egg exports are made mainly during August through December. Small quantities of processed eggs, made from lower grade shell eggs, are exported throughout the season.

---

[1] Prepared in the Livestock and Wool Division and based on information from Charles C. Wilson, Asst. Agricultural Attache, American Embassy, Buenos Aires, Argentina. (Foreign Agriculture Circular FPE 1-52, January 24, 1952. Office of Foreign Agricultural Relations, United States Department of Agriculture, Washington, D.C., U.S.A.

The average annual rate of lay is regarded by tradesmen as medium to low, being estimated at about 6.5 dozen eggs per hen annually. The last official statistics in the census of 1937 reported a rate of 52 eggs per hen annually. Practically every farmer still hatches out his own chicks from eggs of his previous year's flock. Hatching eggs are not selected from the best layers as the hens are free to roam the barnyard and nearby fields. Husbandry practices on the whole are very elementary and have improved little in the last 8 years. Grain is fed on a very limited basis, usually as a supplement only when other feed is limited. Flocks scavenge in grain and millet stubble and have access to abundant green feed.

Peddlers with horse and cart or occasionally with a truck, loaded with household wares, visit every outlying farm to bargain for or buy eggs, chickens, calves, etc. Upon returning to town the peddlers sell to a buyer who transports the eggs to a central market for case counting, candling and sale to wholesalers.

CONSUMPTION

The only consumption data available in Argentina are for the Federal District of Buenos Aires which represents almost 1/5 of the total national population. Approximately 40 million dozen eggs were consumed in the district, including homes, bakeries, etc. during August-July 1950-51. This equals almost 13 dozen eggs per person.

Practically all eggs entering the Federal District are received through the Buenos Aires Municipal Wholesale Poultry and Egg Market and then move into channels for current consumption or are stored for later sale. During periods of scarcity, storage eggs are shipped to the city from interior storage points. Since the municipal market publishes its daily receipts there is a partial record of the movement of eggs to this market.

EGG STORAGE

Stocks of storage eggs on July 31, 1951 in the Federal District were reported at 10,026 cases and there were estimated to be 20 to 25 thousand cases more in storage outside the district. Frigorificos (cold storage firms) try to market storage eggs prior to July, since the flush production begins again in August. Egg stocks during 1950-51 were larger than anticipated and the movement out of storage was deferred by the strong late season production. Early winter wholesale prices for storage eggs were below expectations and out of storage movement light as frigorificos waited for a rise in price. Sizable stocks remained until late in the season.

The heavy exodus from storage in June and July depressed prices and large stocks were sold at a loss of about 13 cents per dozen on eggs valued at approximately 47 cents per dozen. Eggs still in storage will be sold in the next week in the Buenos Aires shell egg market, or will be dried whole with the hope of exporting them to the United Kingdom. Either market will still result in a loss of at least 7 cents per dozen. In fact, storage eggs sold at any time during the last months have been at a loss to the frigorificos. This is expected to discourage many handlers, particularly since the new season is extremely uncertain.

Storage capacity in the Federal District of Buenos Aires is estimated at about 240,000 cases which indicates all facilities were in use during the peak load in February, making it necessary to use storage facilities in the rural areas to a greater extent. Nearby towns in the province of Buenos Aires are thought to have additional storage space for 100,000 cases and in the provinces of Santa Fe; Cordoba, and Entre Rios there are probably facilities for another 100,000 cases.

Egg storage facilities in operation outside Buenos Aires have increased substantially during the previous five years as profits for this service prior to the past season have been substantial. The lack of published information on holdings by rural frigorificos contributed to the past season's losses.

EGG EXPORTS

Exportation of eggs since the first of the year has been very small. Shipments in January were about 5,000 cases to the United Kingdom and 600 cases to Panama, ending shell-egg exports for the 1950-51 season. Small quantities of dried yolks and dried albumen were shipped out in January and March and dried whole eggs in April.

Exporters began to pack at country points for anticipated foreign sales the first days of August, in hopes of a 50,000 case export quota very soon. Government officials have reminded the trade that adequate stocks must predicate the granting of export permits for shell eggs. The increased demand for eggs which has offset much of the seasonal increase in supply is due to a shortage of meat in cities for which no immediate relief is indicated. Thus storage for foreign sales is being curtailed.

Much further delay in the announcement of export permits will make it difficult to make significant exports again this year. Switzerland has indicated a desire to make purchases at profitable prices during October and November but no later, as they want shipments to arrive during December.

The trade has been informed that the United Kingdom and Belgium are also interested in Argentine eggs. European buyers are only in the Argentine market up to the end of the year, after which time their own production is seasonally increasing. The summer production here is also not satisfactory for export. Last year European buyers were in the Argentine market much stronger than exports indicate, but shippers could not obtain permits for foreign sale until the buyers had gone home.

Trade forecasts of exports for 1951-52, a month ago, were 200,000 cases but now have been reduced to 100,000 cases. No imports of eggs were necessary in 1950 nor will be made in 1951 as the remaining months of this year bring on the flush production.

EGG PRICES

Egg prices to producers were quite profitable throughout the 1950-51 season. Many frigorificos lost money, however, in storing eggs from the flush production for later sale. Retail prices ranged from 24 cents to 53 cents per dozen depending on the grade and month of the year, during January-July 1951.

Maximum prices set by the Ministry of Industry and Commerce, approximating the effective prices, are established weekly for the three grades: storage, common, and selected. The storage and common eggs are not graded for quality, size and cleanliness, but are case counted, eliminating rots, spots and leakers. Selected eggs are received from chicken farms fresh and clean and are a very small percentage of the total receipts.

Wholesale prices have been running about 4 cents per dozen under retail values this year although late in the season egg dealers sold storage eggs for wholesale prices at 13 cents or more per dozen under retail values. Farm prices in the producing areas vary in accordance with distances from the Buenos Aires market and usually range from 1 to 4 cents per dozen under the Buenos Aires wholesale price. However, during the export packing season (August-September) it is not unusual for exporters to pay at country points the Buenos Aires wholesale price without any deductions for weight loss, handling charges, etc. Prices for eggs exported in the next few months are expected to be around $17.50 per case of 30 dozen, f.o.b. Buenos Aires.

The maximum prices are set only for Greater Buenos Aires which affects about ¼ of Argentina's population. There are no export price controls for eggs. The present exchange

rate for eggs is 750 pesos per 100 U. S. dollars.

POULTRY

The number of chickens marketed in the first half of 1951 is estimated as somewhat larger than for the first 6 months of last year, as the increase in number killed by frigorificos has a little more than offset the significant decrease in deliveries of live poultry to Buenos Aires. Current marketings of poultry is increasing further in response to the present shortage of red meat.

Chickens killed during February-July 1951 by freezing plants are estimated near 3 million, while last year's comparable total was about 2 million birds. These represent only a small part of those sold for meat since most of the poultry is marketed alive. All exports come from birds killed at freezing plants.

All live poultry entering the Federal Capital must be handled through the Municipal Market. Frozen poultry is moved in Buenos Aires in large quantities only during September through December when there is a relative drop in the market receipts of live birds. Only poultry killed under the National Government Veterinarian Inspection can be moved from rural packing houses to Buenos Aires market. This inspection is for both disease and sanitation and is said to be somewhat comparable to that in the United States. However, there is no government grading system so each firm grades its own poultry. The Argentine grades are not consistent throughout the industry and there is no coordination between companies in this respect. The birds are of fair quality but not graded to United States standards on bruises, pin feathers, and fleshiness. The grading tolerance allowed is reportedly 15 percent by the best companies.

POULTRY EXPORTS

Poultry exports from January through July 1951 were 104,500 pounds, chickens and hens, to the United Kingdom in April and 14,000 pounds of chickens to Curacao in July. The prospects for exports of chickens and fowl in coming months are very limited. High prices paid for birds during the pack now about completed will place Argentine f.o.b. packed costs considerably in excess of world market values. Several markets which normally purchase Argentine birds, such as Trinidad, Curacao, Bermuda, and Panama, are buying their requirements from the United States.

POULTRY PRICES

Poultry retail prices normally fluctuate considerably in accordance with the season reflecting abundance and scarcity

of supply. Maximum retail prices on fresh poultry are being set weekly by the Ministry of Industry and Commerce for the Buenos Aires market. Last week the price was 48 cents per pound, "New York dressed" while 51 cents per pound has been the highest weekly price thus far in 1951. These prices are for freshly dressed and chilled poultry and are standard for all types as no quality differentials are made. At present there is no maximum price for frozen poultry but the trade expects this regulation will be forthcoming in the next few months when storage poultry start to move in quantity. Maximum poultry prices are effective only in Greater Buenos Aires.

Prices paid by poultry packers for chickens delivered at dressing plants in the interior have ranged from 27 to 38 cents per pound live weight. Fowl (hens) prices have been from 21 to 27 cents per pound in the packing season. The average producer sold poultry to middlemen at about 2 cents per pound less than the previously quoted plant delivery prices. The flush poultry marketing season is from February through July with peak movements in March, April, and May.

There are no definite minimum f.o.b. export prices for poultry. However, the Export Committee of the Ministry of Economics reviews the conditions of foreign sales at the time of issuing export permits and if the price is not in accordance with their standards the permit may be refused. Their price standards vary according to country of destination and currency in which the sale is made. Prices for poultry "New York dressed" are expected to be very high, about 65 cents per pound f.o.b. Buenos Aires, during the coming season.

TURKEYS

The number of turkeys packed during the 1951 marketing season closing this month is expected to total about 350,000 birds, about the same as in 1950. Turkey receipts in Buenos Aires have dropped about one half in January-June of 1951 compared to last year. The normal average "New York dressed" weight of turkeys, (toms and hens) is about 12.5 pounds per bird. Turkeys move to market from June through August and, depending on the weather, as late as the middle of September.

Argentine turkeys, mostly of the Mammoth Bronze breed, are hatched in the open by natural incubation and forage over large areas for feed. About 99 percent of the turkeys forage for their feed until 3-4 weeks before market during which period they are fed corn or available home grown grains.

Turkeys are shipped to processing plants by rail in double-decker sheep cars and cattle cars, and by truck. The

sheep cars carry 900 to 1100 birds, depending on the percent of toms. Shipments to the Buenos Aires market are made in coops, single-decker for toms and double-decker for hens. The percent moved by truck is increasing tremendously.

Export prospects for turkey are bright. Present indications are that the United Kingdom will take the greater part of the turkey crop available for export and Brazil is already buying small quantities. Exports this year should be about the same as in 1950, if high local red meat prices do not encourage a larger than usual domestic consumption. Exports are generally made before November 30, promptly after packing, to get the birds to European markets for the holidays.

There are no domestic price controls for turkeys. Export price controls for turkeys are the same as for poultry, which set no specific requirements but are subject to approval by the Export Committee of the Ministry of Economy. The prices paid for turkeys liveweight delivered at processing plant during the killing season was 30 cents per pound. Small exports to Brazil have been made at 63 cents per pound, "New York dressed," f.o.b. Buenos Aires. Prices for turkey exports to the United Kingdom have not been set.

The present exchange rate for turkey exports is also 750 pesos per 100 U. S. dollars.

MARKET SITUATION AND OUTLOOK

Eggs are temporarily in relatively short supply in the major consuming centers, though August is the beginning of the flush season. Demand has increased because of shortages and high prices of red meats and dairy products, and large purchases of eggs at country points for anticipated export. Larger supplies have been directed into Buenos Aires in the last few days, not only in response to the strong demand for current consumption, but also to build stocks for next fall.

Production is expected to be ample for the annual domestic requirements, but if government officials require as large stocks as in previous year before granting export permits, foreign sales of eggs may be very limited. Frigorificos generally are planning a more conservative egg storage program after last year's serious losses.

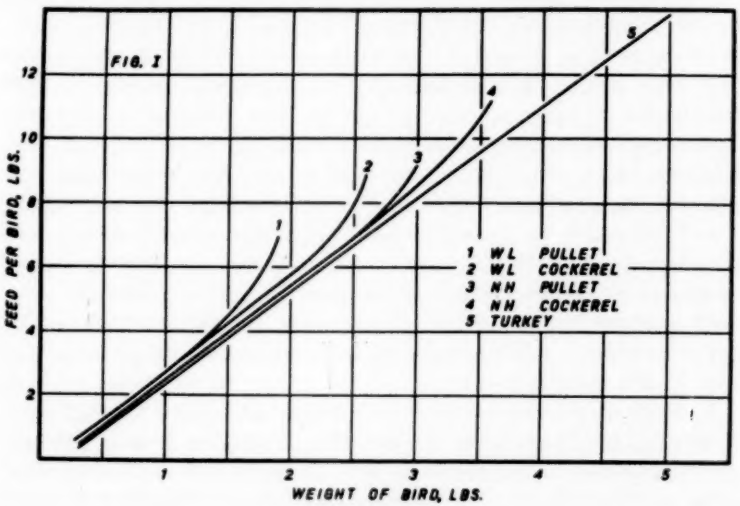
Poultry has been marketed freely since the first of the year as prices have been consistently profitable. Practically all poultry will be consumed domestically during 1951. The turkey crop in 1951 will be about as large as last year but prices paid to farmers by packing houses during the killing season are much higher. Export markets have good prospects and local demand, which heretofore was small, may be increased.

COMPARATIVE FEED REQUIREMENTS OF MEAT CHICKENS[1]

H. J. ALMQUIST
The Grange Company, Modesto, California, U.S.A.

The results of a study of mash and grain selection and feed conversion of Broad Breasted Bronze and Beltsville Small White turkeys, based on data from the Research Farms of The Grange Company, have been printed in booklet form and made available without charge to all interested persons. The results have also been published in a technical journal (1). Similar studies with chickens have been in progress for some time.

During research on laying mash formulas, high quality strains of Single Comb White Leghorns and New Hampshires were started as chicks on feed formulas not greatly different from the laying mash diets intended for ultimate use, except for a protein content of approximately 20% and proper vitamin and mineral balances for young chicks. The numbers of birds used per group were sufficiently large to insure accuracy in weights and feed consumption records which were obtained at weekly periods. The birds were reared in brooder houses and on litter under commercial conditions. The comparative feed requirements of these varieties of chickens



(Figure 1)
Comparative total feed requirements of turkeys and several kinds of chickens.

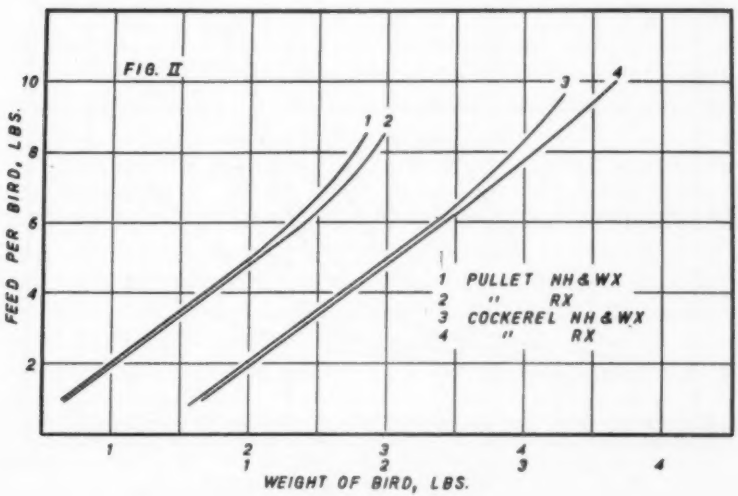
[1] Reprinted with the permission of The Grange Co.

are given in condensed form in Figure 1. The curves in this figure show, for the first time, a number of striking facts.

1. These chickens started out as almost equally good feed converters, irrespective of sex or variety. The two varieties and sexes showed very similar weight gains on the basis of feed consumed up to 1.0 lb. weight, or more in some cases.

2. At 1.0 lb. weight the White Leghorn pullet began noticeably to increase feed eaten per lb. of gain and rapidly changed over to a poor feed conversion. At approximately 1.75 lbs. weight the same departure from efficient feed conversion took place with the White Leghorn cockerel. The New Hampshire pullet showed signs of becoming less efficient at approximately 2.25 lbs. and the cockerel at 2.50 lbs., or slightly higher. It should be added at this point that the Leghorns were from a particularly large strain. Leghorns of more customary size would not be expected to maintain high feed efficiency to these same weights.

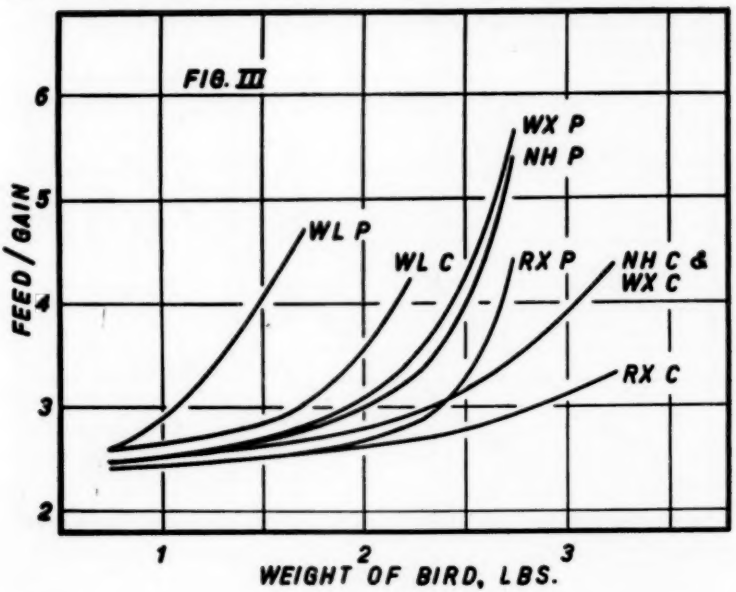
3. The curve of feed consumption in relation to turkey weight for the two varieties and sexes of turkeys previously studied (1) has been added to Figure 1. This shows the remarkable fact that chickens and turkeys, male and female, are at the start equally good feed converters as measured by proportion of feed to gain. They depart from this uniform efficiency only as they attain or exceed approximately one-half of their mature size.



(Figure 2)
Comparative feed requirements of several kinds of chickens.

4. The fact that all these kinds of birds prove to be equivalent feed converters when very young indicates that the formulas of the feeds used were close to a practical ideal for each bird. It is obvious that a bird fed a poor diet could not achieve the efficiency standards established jointly by all these types. It is also obvious that the diets must have supplied the peculiar needs of each kind of bird. As just one example of this statement, it may be mentioned that the optimal protein content of the Leghorn diet was about 20% while that of the starting turkey diet was 28%.

Further illustrations of these findings are provided in Figure 2. The data for this figure were taken from eight field experiments which had been conducted for a variety of reasons. The data were selected to include only the birds on a positive-control commercial broiler mash of 22% protein content. Curve 1 of Figure 2 represents pullets from a strain of New Hampshire (NH) and from a cross of a white variety male with the New Hampshire (WX). Curve 3 represents the cockerels of these two types. In both cases feed requirements of these types were so close that the data were plotted as a single line for each sex. Curves 2 and 4 represent pullets and cockerels of a Barred Rock-New Hampshire Cross (RX). The curves have been separated in the drawing as otherwise



(Figure 3)
Relation of feed/gain ratio to weights of several kinds of chickens.

they would be so close together as to be hardly distinguishable. Many data from flocks of mixed sexes were found to fall on these lines or intermediate to the separate sex lines.

The curves support the previous statements that there is no real difference in feed conversion to be related to sex or variety in the first stages of growth. Birds which attained larger size remained efficient converters to larger weights. This fact is shown more plainly in figure 3, where the feed/gain ratio, or instantaneous feed efficiency, has been plotted against body weight. After approximately 1 lb. of body weight, the White Leghorn pullet changed rapidly to a poor feed efficiency. The White Leghorn cockerel, White Cross pullet, New Hampshire pullet and Rock Cross pullet, in succession, showed the same rapid upswing in the feed/gain ratio. The New Hampshire cockerel and the White Cross cockerel are represented by the same curve since they remained very close together over the period of the present comparison. The Rock Cross cockerel maintained the best feed efficiency for the longest period.

These curves resemble closely the previous results obtained with four kinds of turkeys (1). The upward trend of the feed/gain ratio after certain weights had been reached by each kind of chicken or turkey was related to body weight, irrespective of sex. There appears to be no basis for the belief that the female, in particular, becomes an inefficient converter because she changes to a less efficient type of metabolism.

It seems most probable that, in the early stages of growth, all these kinds of fowl are under one and the same primary control, such as the growth hormone. At the size where each kind of fowl begins to secrete less growth hormone, the feed efficiency also becomes poorer.

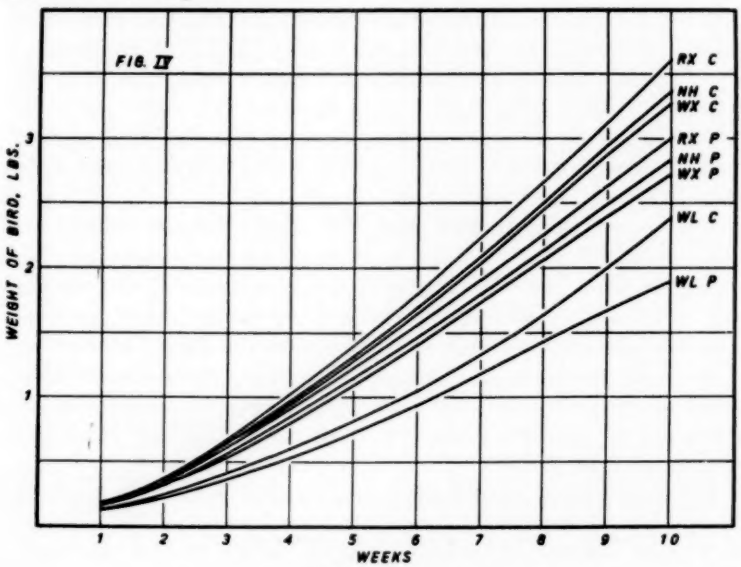
The colored varieties of chicks used in these studies all had the same strain of New Hampshire parentage on the maternal side. The differences in performances of the chicks are attributable largely to the differences in male parentage. This does not mean, necessarily, that the Rock Cross chick is thereby a permanently superior type from the standpoint of feed efficiency. It does mean, however, that the male parent is an extremely important factor in the feed efficiency of a meat type chick.

The practical significance of this fact is that, to prolong the period of maximum feed efficiency to any stated weight, it will be necessary to select for the adult size of the bird. For example if a 3.5 lb. bird is desired at maximum feed

efficiency, the parents of that bird should be of stock which will attain at maturity an average size of at least 7 lbs. This is cited only as a rough example—the actual application of this relation requires further studies of comparative meat bird and parent sizes and the advantages of crosses as compared to purebreds. The principle involved, however, is here clearly illustrated.

Proper selection of meat bird types includes the consideration of feathering, feather color, body conformation, dressed appearance, vitality, egg production, fertility and hatchability. Since feed cost is the largest part of the expense of raising a meat bird, efficiency of feed conversion remains one of the most important qualities of a good meat bird type.

Choosing the female parent of a meat chick is more or less restricted because of the necessity for high production, fertility and hatchability which will permit a minimum cost of hatching eggs and chicks. Because of demand for chicks it is usually impractical to select closely or to discard many hens. There is some limitation also beause of egg size which must be maintained in a certain range to conform to existing practices. It would appear that the best approach to improvement in feed efficiency would be through development or selection of the male parent to a suitable size, as well as other desired qualifications.



(Figure 4)
Growth curves of chickens.

The growth curves of the chickens used in these comparisons are given in Figure 4. These curves illustrate the fact that birds which maintain high feed efficiency longest are also the ones which grow most rapidly. It may be added that these curves show no evidence of so-called "pause periods." In none of our studies of chickens and turkeys have we ever seen any deviation from smooth growth curves that could not be attributed to known changes in diet, management, health or environment.

We wish to emphasize that the above presented data and conclusions apply to the actual birds studied. We do not imply that the findings are necessarily typical of all varieties of chickens. We do believe that the facts brought out have wide application and could be useful to the industry.

REFERENCE

1. Comparative Mash Consumption Grain Consumption and Feed Efficiency of Broad Breasted Bronze and Beltsville Small White Turkeys. H. J. Almquist. Published by The Grange Company, Modesto, California. Also, World's Poultry Science Journal, April-June, p. 103, 1951.

WANTED

WORLD'S POULTRY CONGRESS PROCEEDINGS

Inquiries concerning the proceedings of the following previous World's Poultry Congresses have been recently received: Holland (1921), Italy (1933), Germany (1936). If any person has any of these Proceedings and would care to dispose of them please notify Dr. G. F. Heuser, Rice Hall, Ithaca, N. Y., U.S.A.

UTILIZATION OF FEED BY POULTRY

W. W. CRAVENS
University of Wisconsin, Madison, Wis., U.S.A.

The utilization of feed by poultry must be considered in two categories. These are the utilization of feed for meat production, and for egg production. It seems desirable that we also keep in mind the efficiency of transfer of various nutritive factors to eggs and meat as well as the overall conversion of feed to product.

The efficiency of conversion of feed to poultry meat and eggs may be influenced by a number of factors. The more important of these are age and size of bird, environmental conditions, genetic constitution and quality of feed supplied.

The gross efficiency of utilization of feed for poultry meat production has increased markedly in recent years. For example, the most up-to-date information available in 1944, which was included in the National Research Council Report No. 1—Recommended Nutrient Allowances for Poultry, indicated that about 10.5 pounds of feed were required to produce a 3.0 pound broiler in 13 weeks. Numerous reports that have appeared recently show that a 3.0 pound broiler can be produced in 10 week's time with about 9.0 pounds of feed. Some reports have shown an even higher efficiency of conversion of feed into poultry meat.

The gross efficiency of feed utilization of turkeys has similarly increased in recent years.

OLDER CHICKENS REQUIRE MORE OF FEED FOR MAINTENANCE

In producing meat chickens it must be kept in mind that gross efficiency declines as the animal develops to maturity. This is because of the increase in the proportion of feed used for maintenance. Heuser states that for White Leghorn chicks approximately 65 per cent of the feed is used for maintenance the first month, 75 per cent the second, 80 per cent the third, 85 per cent the fourth and 90 per cent the fifth. Only after maintenance is satisfied can growth occur and since maintenance increases rapidly with age, gross efficiency declines. From the economic standpoint this is a very practical problem.

Take, for example, the case of a growing turkey. Almquist has recently reported extensive data on growth rates and feed efficiency of turkeys. The data show that for B. B. Bronze turkey hens the amount of feed required per pound of gain increases rapidly after the birds reach 10 pounds in

weight. The feed:gain ratio is about 5:1 for 10 pound hens; at 15 pounds the ratio of feed:gain is near 10:1. For toms the increase in feed per unit of gain is almost linear until the bird reaches about 21 pounds. At this weight the ratio is about 5.25:1. At 25 pounds the ratio is 6.25:1. Similar declines in efficiency of converting feed into meat have been reported for chickens as mature weight is approached.

POUNDS OF FEED PER DOZEN EGGS ANALYZED

Several studies on efficiency of utilization of feed by laying hens have been conducted. The chief factors affecting gross efficiency of egg production are size of bird and rate of lay.

The reason for the pronounced effect of these two factors on utilization of feed by laying hens is because of the high proportion of feed required by the hen being used for maintenance. Studies by Titus and by Brody and co-workers have yielded surprisingly comparable data on the amount of feed above maintenance required to produce an egg. The data indicate about 40 gms. of feed to produce a 2 oz. egg.

Feed consumption, body weight and egg production data have been analyzed and used to establish equations from which feeding standards can be calculated.

When these equations are applied the following result will be obtained: One hundred four-pound birds not laying will consume 15.5 pounds of feed daily while 100 seven-pound birds will consume 22.3 pounds of feed daily. At a 40 per cent rate of production, 100 four-pound birds will consume 21.2 pounds of feed and 100 seven-pound birds will consume 28.0 pounds feed daily. At a 70 per cent rate of production (255 eggs per year), daily feed consumption will be 25.4 pounds and 32.2 pounds for four- and seven-pound birds respectively.

This same information may be stated as follows in terms of pounds of feed required per dozen eggs:

100 birds weighing	*Pounds feed per dozen eggs at two rates of production*	
	40%	70%
4 pounds	6.4	4.4
7 pounds	8.4	5.5

Such data serve to emphasize the important relationship between rate of production, size of bird, and efficiency of feed utilization.

Obviously other factors enter into the overall efficiency of conversion of feed into eggs but size of bird and rate of

production are the major factors.

The efficiency of transfer of nutritive factors from the feed to eggs or poultry meat has been studied by several workers particularly with respect to energy, vitamin A, vitamin D, and riboflavin. Brody gives the gross energetic efficiency of laying hens as follows:

Eggs per year	*Per cent energetic efficiency*
100	11
150	14
200	17
250	20
360	27

For net energetic efficiency of egg production the same author gives a value of 54-77 per cent as a range obtained from data from different sources.

According to Almquist, about 22.9 per cent of the feed protein used for rearing and 1.5 years of production is recovered in the egg protein and in the carcass.

TRANSFER OF NUTRITIVE FACTORS VARIES

The recovery of vitamins A, D, and riboflavin in the egg varies with the level of feeding. Studies have shown that up to 25 per cent of the dietary vitamin D may be deposited in the egg at low levels of intake. At levels approximating the recommended allowances for vitamin D, about 10 per cent of the vitamin would be recovered in the egg. At high levels of supplementation, a much lower percentage of the vitamin would be deposited in the egg. Studies with vitamin A or vitamin A active compounds have shown a similar efficiency of transfer of this vitamin from the feed to the egg. The efficiency of transfer of riboflavin at practical levels of supplementation has been shown to be about 25 per cent. As with vitamins A and D the efficiency of transfer declines at high levels of fortification. Calculations from some of our data on folic acid and biotin indicate about the same relative transfer of these vitamins to the egg as has been obtained with riboflavin.

For meat birds, Almquist has calculated that about 16 per cent of the feed protein is recovered in the meat. Approximately 3.9 per cent of the potential fat (includes fat and available carbohydrates) of the feed is recovered in the meat of chickens. For turkeys the percentage of recovery is 8.4.

The information given shows that the chicken and turkeys are efficient converters of feedstuffs into highly nutritious products. It seems desirable however that we continue to study ways and means of further increasing the efficiency of utilization of feed by poultry. Progress in the nutritional field has been rapid in recent years and evidence is accumulating to show that progress can be made by genetic techniques. (Proceedings First Institute of Animal Agriculture).

TRAINING 4-H EGG SPECIALISTS

HARRIETTE E. CUSHMAN
University of Montana, Bozeman, Mont., U.S.A.

4-H egg-quality demonstrations are educating Mrs. Housewife of Montana. Yes, Montana has an egg law, as have most of the States. According to Montana's law, all retail eggs must be sold on grade with the grade seal affixed. But this does not solve our egg-marketing problem. Our homemakers, like other women of the Nation, are influenced more by education than by regulation in their egg-buying habits. For this reason, we have sponsored a 4-H egg-quality demonstration activity slanted toward consumer education. To enroll, a girl must be taking a food project for her second year and have passed her fourteenth birthday by January 1 of the current year.

The activity is divided into two parts, the demonstration itself and the campaign phase. In the first part, those girls who give a demonstration of blue-ribbon quality in their own counties come to the 4-H State Congress where they present their demonstrations and are given a numerical score. Their scores are not publicized until October 1 when the contestants finish the campaign part of the contest. This comprises 50 percent of their final rating.

In the campaign phase, the girls give their demonstration to as many consumer groups as possible. Each gets 65 points for demonstrations given, which takes into account the number given, the percentage of county population reached, the proportion of rural to urban people, the proportion of adult to youth groups. The demonstration arrangements, including general distribution over the county and the percentage of arrangements made by members against those made by local leader or extension agents, are given a possible 25 points.

The results are given a possible 10 points. In offering the contest, we state that the purpose is to: (1) Acquaint homemakers with the State grades of eggs and how to distinguish each grade: (2) show homemakers the use of the various grades in cookery, bearing in mind the food value, flavor, and "eye appeal;" (3) help homemakers to determine how to get more out of their food dollar, which includes the proper use of undergrades; (4) show homemakers how to care for eggs in the home so that quality can be maintained.

This contest was started in 1940 but suspended during the war years. To date, 37 girls have carried the contest through to completion, giving 544 demonstrations before 25,610 persons. When you consider that the entire population of Montana is about equal to that of the city of Minneapolis, we feel that the 4-H members have made a lot of contacts and that many persons are beginning to demand top-grade eggs and to know whether they are receiving what they have purchased.

NATIONAL INTEREST NEEDED

In the past the State winner received an all-expense trip to the National 4-H Club Congress. But nothing stands still. The 4-H Club department feels that with many of the subject-matter activities, members may receive more benefit from a trip to an event where the subject matter of their project is the event. Following this line of thinking the member working hard on selling the idea of egg quality could be greatly benefited by going to an event sponsored by the Poultry and Egg National Board or the American Institute of Poultry Industries. To further this idea the Montana 4-H department is willing to pay all expenses of the Montana winner this year to such an event, in hopes of selling the idea to the organization so that they may in turn be future sponsors.

However, Montana cannot do the job alone. I doubt that we can get to first base unless there is national interest shown. Therefore, we would like to know how such an activity would appeal to other States. Could we get enough States to participate on a national basis to make the event worth while. If it could be done, it would certainly be a real factor in promoting consumer education. Then, with consumers truly knowing egg quality and demanding it, retailers are going to meet this demand, thereby benefiting the entire poultry industry. (Extension Service Review)

REVIEW OF POULTRY PUBLICATIONS

Compiled by J. W. Kinghorne,

1365 Iris St., N. W.

Washington 12, D. C., U.S.A.

GENETICS

ARIMA, SHIRO.
[THE REARING OF CARINA MOSCHATA IN THE VICINITY OF MATSUE-CITY (SHIMANE PREF.).] [In Japanese] *Collecting and Breeding 6:* 138-139. 1944.—*C. moschata* has been bred in Formosa and the F_1 of *C. moschata* x *Anas platyrhyncha* var. *domestica* has long been utilized as food. The fact that the sides of the head and face are covered with reddish protuberances distinguish *C. moschata* from any ducks and geese, but as its meat has a peculiar odor, Formosans prefer their F_1 with *Anas* in spite of their lack of egg-laying capacity. In 1941 a few *Carina* were brought from Formosa to Matsue City. Eggs hatched in 34-35 days. An F_1 has not yet been produced.—*O. Shinji.* (Biological Abstracts)

BERNIER, PAUL E., LEWIS W. TAYLOR, and C. A. GUNNS. (U. California, Berkeley.)
THE RELATIVE EFFECTS OF INBREEDING AND OUTBREEDING ON REPRODUCTION IN THE DOMESTIC FOWL. *Hilgardia 20:* 529-628. Illus. 1951.—Part I (pp. 529-534.)—Sources of stock and design of expt. Origins and characters of stocks used in a triallel system of mating involving inbreeding, outcrossing, and crossbreeding are described. Part II (pp. 535-546).—Fertility. Inbreeding, in itself or to varying coeffs., did not directly influence fertility of matings, but produced a population of females less fertile than those of outbred origin, irrespective of the kind of male to which they were mated. Females laying at a higher rate had better fertility in one of the 2 year's results. Part III (pp. 547-559).—Hatchability. Inbreeding of outbred females (from F=0 to F=0.25) resulted in decreased hatchability; further inbreeding of inbred females led to no significant decrease. Regardless of mating system, inbred females showed lower hatchability than outbred, but differences were .ot significant. Birds laying at high intensity produced eggs that hatched better in one of 2 yrs. Fertile eggs laid before 8 a.m. and after 2 p.m. did not hatch as well as those laid between those hrs. Eggs requiring 23 hrs. or less and 27 hrs. or more for formation hatched poorer than those requiring time between those hrs. Premature and delayed oviposition decreased hatchability. Eggs in clutch positions intermediate between first and last hatched significantly better than eggs in those positions. Part IV (pp. 560-610).)—Early embryonic growth. Inbreeding resulted in smaller mean blastoderm diam. in unincubated eggs and in lower mean number of somites after 38 hrs'. incubation than outbreeding. Outcrossing resulted in larger mean diameters and higher mean number of somites than crossbreeding. Significant differences in early embryo size were found in one yr. between the inbreeding

and the outbreeding of a presumably highly heterozygous group of the birds with an outbred origin. Effects of inbreeding are explained tentatively as a result of homozygous deleterious genes which retard embryonic development and may lead to embryonic mortality. Inbreeding may also delay initiation or decrease rate of embryonic development. Eggs in first and last clutch positions contained embryos more advanced in development than those in intermediate positions. A linear relation was found between length of time interval separating the oviposition of successive eggs and embryo size. Significant differences in early embryo size were demonstrated between individuals, even after adjustment for regression of size on time interval. These were interpreted as due-to individual differences in synchronization between oviposition of the preceding egg and ovulation, variations in body temp., genetic factors affecting embryonic growth rate, and early embryonic mortality preceded by developmental retardation. Part V. (pp. 611-622).—Interrelationships of characters studied. Origin (genetic relationship) and systems of mating did not alter general relationship between fertility and hatchability. Closely inbred matings of birds with an outbred origin showed a negative correlation between fertility and hatchability, supporting the view that fertility is distinct from hatchability. Normal relation between early embryo size and hatchability is curvilinear, with eggs relatively more advanced or relatively less advanced in development not hatching as well as eggs produced in time intervals of 23-27 hrs. and laid in intermediate clutch positions in the middle part of the day. Following close inbreeding of birds with an outbred origin, relationship between early embryo size and hatchability was linear and increased in magnitude and significance as the embryos measured became older.—*L. W. Taylor.* (Biological Abstracts)

BUSS, E. G.
A NEW SINGLE PEN SYSTEM FOR PEDIGREE BREEDING OF TURKEYS. *Colorado Farm & Home Research 1:* 6, Nov.-Dec. 1950. (Experiment Station Record)

BUSS, E. G., B. B. BOHREN, and D. C. WARREN. (Purdue U., Lafayette, Ind.)
THE INHERITANCE OF "STRINGY", AN ABNORMAL FEATHER CONDITION IN WHITE LEGHORN CHICKENS. *Jour. Heredity 41:* 143-144. 1950.—An investigation was made to determine the mode of inheritance of an abnormal feather condition in White Leghorn chickens which were given to the Kansas and Purdue Experiment Stations. The most noticeable expression of this condition was the ragged appearance of the feathers. The primary and secondary wing and tail feathers of abnormal birds were generally shorter than the same feathers on normal birds. The barbules were absent on most wing and tail feathers. In addition the toenails and the premaxilla of the beak were longer than in normal birds. Crosses were made at each of the stations; also crosses between the stocks from the two stations. A single autosomal recessive gene was responsible for this mutant, which has been called "stringy." —*Auth. summ.* (Biological Abstracts)

ESSARY, E. O., G. J. MOUNTNEY, and O. E. GOFF. (U. Tennessee, Knoxville.)
CONFORMATION AND PERFORMANCE IN STANDARDBRED AND CROSSBRED BROILERS. *Poultry Sci. 30:* 552-557. 1951.—Comparisons to 12 weeks of age were made in the growth rate, rate of feathering, feed efficiency, and body conformation of New Hampshire (production strain), New Hampshire (broiler strain), Barred Rock males x New Hampshire females (broiler), New Hampshire males x Barred Rock females, and standardbred Barred Rocks. At 12 weeks of age the broiler strain of New Hampshires gave a higher percentage of rapid feathering than did the production strain. All chicks from the Barred Rock x New Hampshire cross were classified as fully feathered although the Barred Rock males going into the cross failed to carry the sex linked rapid

feathering factor. At 12 weeks of age the Barred Rock x New Hampshire chicks averaged 4 pounds each, the heaviest of any lot. The New Hampshire x Barred Rock cross averaged 3.8 pounds per chick. Ranked in order of the smallest amt. of feed required to produce one pound of gain, the breeds and crosses were Barred Rock x New Hampshire, New Hampshire x Barred Rock, Barred Rock, New Hampshire (broiler strain), New Hampshire (production strain). The Barred Rock x New Hampshire chicks had an avg. breast width of 1.58 inches while the New Hampshire x Barred Rock breast width was 1.48. The Barred Rock x New Hampshire and Barred Rock chicks had the longest keel length measuring 4.11 inches. The shortest keel length existed in the New Hampshire production strain being 3.76 inches.—*E. O. Essary.* (Biological Abstracts)

FINNE, IVOR, and NILS VIKE. (Norwegian State Sch. Teachers of Smallholders, Norway.)

A NEW SUB-LETHAL FACTOR IN HENS. *Poultry Sci. 30:* 455-465. Illus. 1951.—A hereditary atresia of the oviduct, assumed to be caused by a single dominant factor, was observed in White Leghorn females, at the onset of egg production. The ovary develops normally and ovulation of the yolks is normal. However they pass into the abdominal cavity since the oviduct is ruptured at the isthmus. Rupture is frequently accompanied by constriction of the section between the vagina and cloaca. In males there was rupture of the right seminal duct behind the testis. —Authors. (Biological Abstracts)

GLAZENER, E. W., W. L. BLOW, and R. S. DEARSTYNE.

BREEDING IMPROVED BROILERS. North Carolina's *Research and Farming 9:* 6, Spring 1951. (Experiment Station Record)

GODFREY, GEORGE F.

ON THE NATURE OF GENETICAL CONTROL OF EGG SHELL QUALITY AS IT AFFECTS HATCHABILITY IN DOMESTIC FOWL WHICH LAY BROWN EGGS. *Ohio State Univ. Absts. Doctoral Diss. 60:* 131-133. 1950.—Ohio and Oklahoma strains of N. Hampshire red pullets were used. 3657 eggs of the former selected at random and 3050 of the latter for 35-week and 15-week periods, respectivley, provided data to show that the color of shell, specific gravity, and wt. loss over a 14-day incubation period are connected with hatchability and quality of shell. Eggs with dark brown shells, high specific gravity and a low wt. loss for the given period hatch better than others.—*C. E. Packard.* (Biological Abstracts)

GREENWOOD, A. W., and J. S. S. BLYTH. (Poultry Res. Centre, Edinburgh 9.)

GENETIC AND SOMATIC ABERRATIONS IN TWO ASYMMETRICALLY MARKED FOWLS FROM SEX-LINKED CROSSES. *Heredity 5:* 215-231. 1951.—Two cocks, from Light Sussex female x Rhode Island Red male, each exhibited the plumage and leg color of both parents; in one the color distr. was almost perfectly bilateral, in the other less so. In both cases the abnormalities extended to the germinal as well as the somatic tissue. Breeding tests with the 2d cock suggested that he had one normal testis while the other was producing no sperm carrying genes for silver plumage or white legs. The situation was similar in the other male but the proportion of silver chicks produced was much smaller, and it seemed likely that the "silver" part of his testis also was deficient and lacked the genetic basis for Rhode Island Red type plumage. The breeding behavior of his progeny was normal.—*J. S. S. Blyth.* (Biological Abstracts)

HAYASHI, BUMPEI.

[MOTTLED DOWN FEATHERS OF A HYBRID HEN.] [In Japanese] *Collecting and Breeding 6:* 125. Illus. 1944.—Purple mottled down feathers were found in a hybrid from a White Leghorn and a Chokoku rooster.—*O. Shinji.* (Biological Abstracts)

HAYS, F. A. (U. Massachusetts, Amherst.)
REPRODUCTIVE EFFICIENCY OF YEARLING HENS. *Poultry Sci. 30:* 569-574. 1951.—Data include 436 R. I. Red Hens bred for high fecundity and used for breeding during their first 2 laying yrs. Hens in their 2d laying year were shown to be somewhat less efficient breeders than the same individuals were in their 1st yr., they laid fewer eggs, had lower fertility, lower hatchability and averaged about 5 fewer chicks in the same hatching period.—*F. A. Hays.* (Biological Abstracts)

HAYS, F. A., and E. W. SPEAR. (U. Massachusetts, Amherst.)
RELATION OF THE SEX-LINKED GENE SL FOR RAPID CHICK FEATHERING AND AGE AT SEXUAL MATURITY IN RHODE ISLAND RED PULLETS. *Poultry Sci. 30:* 625. 1951.—Data on 631 R.I. Red pullets showed no linkage relation between the sex-linked gene sl for rapid chick feathering and the sex-linked gene E for early sexual maturity. It is considered necessary to employ other marker genes for the sex chromosome if the location of gene E is to be established. —*Authors.* (Biological Abstracts)

HUTT, F. B. (Cornell U., Ithaca, N. Y.)
SHORT CUTS IN PROGENY TESTING. *Scottish Agric. 30:* 183-188. 1951.—Progeny testing is defined and is shown to be the expert work of, say, only 1% of poultry keepers; such proportion is sufficient to maintain the improvement of poultry stocks. The advantages of the short cut, where tests are made on the 500th day from hatching instead of 365th day from first egg, are: tests are 45 days earlier, house space is saved, computing next years' sections is put through earlier and birds not retained for breeding can be marketed at once. Details are given of the method of recording, partial-tests for family ranking, sib-tests, sampling of eggs for tests, multiple shifts for cockerel tests and dam tests.—*C. E. Foister.* (Biological Abstracts)

HUTT, F. B. (Cornell U., Ithaca, N. Y.)
GENETICS OF THE FOWL. xi+590. Illus. McGraw-Hill Book Co.: New York, 1949.—A survey of present knowledge of heredity and variation in the domestic fowl. An introduction reviews the phylogeny and classification of birds, the characters of the genus Gallus and its subspp., the origin of domestic fowl and of breeds, and breed standards. A 2d chap. deals with gametogenesis and the chromosomes. 11 chaps. discuss the morphology, history, and genetics of the known variations in skeleton, skin structure and color, plumage and plumage color, body size, eggs, egg production, disease resistance, and reproduction, and lethal and miscellaneous characters. The last 2 chaps. discuss linkage (including the chromosome map and variations in crossing-over), and practices in mass selection, progeny testing, inbreeding, and utilization of hybrid vigor. An appendix lists the mutant characters, their gene symbols, date of introduction, author's name, and reference to the description in the text. There is a glossary, and author and subject indexes. (Biological Abstracts)

OAKBERG, EUGENE F. (U. S. Region. Poultry Res. Lab., E. Lansing, Mich.)
GENETIC DIFFERENCES IN QUANTITATIVE HISTOLOGY OF THE ADRENAL, ORGAN WEIGHTS, AND INTER-ORGAN CORRELATIONS IN WHITE LEGHORN CHICKENS. *Growth 15:* 57-78. 1951.—Quantitative histology of the adrenals and body and organ weights was studied for 158-, 120-day, male and female White Leghorn chickens from 4 inbred lines. Individual birds differed significantly in percentages of cortex and medulla in all lines. Sex differences were observed for amount of both cortex and medulla in one line, in medulla for a 2d line, and in cortex for a 3d line. Heavier adrenals were observed for males in 3 lines, and for females in 1 line. Correction for body weight reduced most inter-organ correlations, but specific relationships also were indicated, especially between pancreas and spleen and between spleen and thymus. It is concluded that genetic constitu-

tion is an important variable in the growth patterns in all comparisons. (Biological Abstracts)

OAKBERG, EUGENE F. (U. S. Region. Poultry Res. Lab., East Lansing, Mich.)

INFLUENCE OF GENETIC CONSTITUTION ON GROWTH OF LYMPHOID TISSUE IN LIVER AND PANCREAS OF WHITE LEGHORN CHICKENS, AND CORRELATION OF LYMPHOID TISSUES WITH WEIGHTS OF SOME VISCERAL AND ENDOCRINE ORGANS. *Growth 15:* 79-100. 1951.—Lymphoid tissues of liver and pancreas were studied for 158 male and female chickens of 4 inbred lines. Significance of line and family differences indicates that genetic constitution is an important variable in growth and development of ectopic lymphod foci. A low correlation between growth of lymphoid tissue in liver and pancreas was demonstrated. Amount of lymphoid tissue in liver and pancreas was correlated with pancreas and spleen weights. Amount of lymphoid tissue in the pancreas of 120-day females gave a positive, significant correlation with incidence of leucosis in sibs kept for 600 days. However, the number of areas in the liver gave a similar significant positive correlation with ability to survive death from all causes. (Biological Abstracts)

SMITH, ROBERT M., and WILLIAM H. WILEY.

FURTHER STUDIES IN CROSSBREEDING FOR BROILER PRODUCTION. *Arkansas Agric. Expt. Sta. Bull. 499.* 1-32. 1950.—57 groups totaling 3153 chickens, were raised to 12 weeks of age. Crosses included combinations of 3 strains of White Wyandottes with 3 strains of R. I. Reds; reciprocal crosses between White Leghorns and White Jersey Giants, White Leghorns and New Hampshires, and dominant White Plymouth Rocks and New Hampshires. The F_1 progeny from the station strains of White Wyandottes and R. I. Reds were not consistently larger at 12 weeks of age than the heavier purebred. Certain strains of White Wyandottes combined to increase growth rate of progeny, while other strains had the opposite effect. In crosses involving New Hampshires, growth rate was not consistently higher than that of the New Hampshire parent. Feed requirements of the crossbred groups were lower than those of the more efficient parent in 12 comparisons. Comparing feed requirements of crossbreds with those of the more efficient parent seems a more practicable measure of feed efficiency than a comparison with the parental mean, since differences between parents of the crosses were practically equal to differences between the crossbred and the more efficient parent. The New Hampshire breed was consistently more efficient in feed utilization than the other pure breeds. Crossbreeding increased hatchability of the fertile eggs set over performance of the parent with the higher hatch. Fertility was impaired by crossbreeding. Variations in percentage of bare-backs at 12 weeks of age which existed between trials and within breeds indicated that this is not a reliable measure of the inherent rate of feathering.—*M. L. Lavallard.* (Biological Abstracts)

WATERS, NELSON F. (U. S. Region Poultry Res. Lab., East Lansing, Mich.)

BODY WEIGHT OF DIFFERENT INBRED LINES OF CHICKENS. *Poultry Sci. 30:* 615-620. 1951.—Extending over a period of 8 yrs., definitive body wts. of 6 inbred lines of female White Leghorn chickens were obtained. As the coeff. of inbreeding increased, there was a more or less steady increase in definitive body wt. of 1 of the lines, a progressive decrease in another line, while for the other 4 lines the mean body wt. remained relatively constant over an 8-yr. period. Apparently intensive inbreeding per se will not necessarily decrease the definitive body wt. of chickens.—*N. F. Waters.* (Biological Abstracts)

HYBRID CHICKENS ARE ON THE WAY. North Carolina's *Research & Farming 8:* 8, Spring 1950. 72nd. Annual Report. (Experiment Station Record)

PHYSIOLOGY

BOYD, G. S.

CHOLINE METABOLISM IN THE EMBRYO CHICK. *Biochemical Jour. 49:* vii, June 1951.—It has now been shown that the liver of the chick embryo contains the choline oxidase enzyme system and that the liver can methylate homocysteine to yield methionine. It is concluded that the liver contains a transmethylase, and that transmethylation in the chick embryo follows the same course as in the rat. (Experiment Station Record)

BRANDT, L. W., ROBERT E. CLEGG, and A. C. ANDREWS. (Kansas State Coll., Manhattan.)

THE EFFECT OF AGE AND DEGREE OF MATURITY ON THE SERUM PROTEINS OF THE CHICKENS. *Jour. Biol. Chem. 191:* 105-111. 1951.—Both salt precipitation and electrophoretic methods of analysis particularly the latter showed differences in the serum proteins of laying and non-laying chickens. The electrophoretic pattern of the serums of all the laying birds contained a fast moving component not observed in the non-laying groups and the relationship of this component was emphasized by its appearance in those birds just starting to produce eggs. (Biological Abstracts)

BRANT, JOHN W. A. (U. Illinois, Urbana.)

RATE OF EARLY GROWTH IN DOMESTIC FOWL. *Poultry Sci. 30:* 343-361. 1951.—The main purpose of this work was (1) to define rate of growth, i.e., the progressive augmentation of the body as measured by a function such as change in wt. per unit of time, and (2) to state simply a new method for studying growth-in-time, viz.: represent graphically the variable x and y as a smooth curve; select form of equation which will describe the smooth curve drawn and transform equation to linear form through substitution of variables; evaluate the constants of equation by method of least squares; and submit the constants of equation to method of analysis of variance and/or other tests of significance. The equation $y=ae^{bx}+c$ was used to evaluate b, the rate-of-growth constant. Interpretation of constants c and a and further analyses will be reported later. Constant b describes the rate of early growth in any one of the 395 individuals of the expt. from the end of the 1st to the end of the 12th week. Two standardbred and 2 crossbred groups, RIR and BPR, and their breed-reciprocal crosses, were mated to give progeny to supply the wt. data, which was taken in grams weekly. Analyses of variance of rate of growth, viz., between hatch, between-sex, and between-breed group, showed that the hatches differed significantly; the least variable breed was the RIR-standardbred; the least variable sex was the male; and that sex difference was more important than hatch difference, both of which were far more important than difference between crossbreds and standardbreds.—*J. W. A. Brant.* (Biological Abstracts)

BRENEMAN, W. R. (Indiana U., Bloomington.)

A FACTORIAL ANALYSIS OF PITUITARY—GONAD-COMB RELATIONSHIPS IN THE CHICK. I. ACTION OF PREGNANT-MARE-SERUM AND TESTOSTERONE PROPIONATE ON ANDROGEN SECRETION. *Poultry Sci. 30:* 231-239. 1951.—The statistical technic of factorial analysis was used to investigate interactions involving gonadal and pituitary hormones. The single gonad of the unilaterally-castrated chick secretes considerable amts. of androgen as measured by comb growth. This secretion is much less, quantitatively, than that released by the 2 gonads of the normal animal. The secretory activity of the single gonad is only slightly increased by the addition of pregnant mare serum (P.M.S.), and this increase is prevented by the simultaneous injn. of testosterone propionate. Likewise, the androgen output of the 2 gonads of the unoperated chick is slightly stimulated by P.M.S. at the low dosage level of 30 I.U. There is, however, a very significant inhibi-

tion of this secretory activity when testosterone-propionate is administered in combination with the P.M.S. The possibility that P.M.S. contributes to the secretion of an extra-gonadal androgen is considered. The effectiveness of testosterone-propionate on comb growth is relatively greater in the capons than in either male or unilaterally-castrated males. It is concluded that the one testis of the unilaterally-castrated chick has a limited ability to respond to gonadotropin and also a limited ability to secrete androgen. (Biological Abstracts)

BRENEMAN, W. R. (Indiana U., Bloomington.)
A FACTORIAL ANALYSIS OF PITUITARY - GONAD-COMB RELATIONSHIPS IN THE CHICK. II. ACTION OF PREGNANT-MARE-SERUM AND TESTOSTERONE PROPIONATE ON THE GROWTH OF THE PITUITARY AND GONAD. *Poultry Sci. 30:* 399-408. 1951.—A factorial analysis was made of expts. with capons, unilateral-castrates, and unoperated chicks which were given pregnant-mare-serum (PMS) and testosterone propionate, separately and in combination. The single testis (right) of the unilateral-castrate was slightly larger than either testis of the unoperated chick but there was no marked compensatory hypertrophy. Pregnant-mare-serum (30 I.U.) produced a significant increase in the wt. of the testes of the unoperated chick but had little effect on the wt. of the testis of the unilateral. It was concluded that the testis of the unilateral-castrate has a limited ability to grow and secrete androgen in response to gonadotropin. Testosterone propionate (0.50 mg.) inhibited testicular growth in the unoperated birds but the weight of the testis in the unilateral actually slightly increased. The stimulating effect of PMS on the gonads of unoperated chicks was counteracted by testosterone-propionate, but there was no significant interaction between the two hormones in the unilateral castrate. The right and left gonads of the cockerel differed in their response to the hormones; the right testis was much more affected by PMS and testosterone propionate. The right testis, in addition, responded differently as the single testis of the unilateral than it did when in the unoperated chick. The capon pituitary was much heavier than the pituitary of either the unoperated or unilaterally castrated chick. There was no evidence of the accumulation (backlog) of additional gonadotropin in the pituitary following injn. of PMS into capons but the pituitary weight of the unoperated chicks so treated was increased. Testosterone propionate did not inhibit pituitary weights in either unoperated chicks or unilateral-castrates but did produce a significant decrease in the pituitary weight of the unilaterals following admn. of testosterone propionate; this was correlated with the previously observed increase in testis wt. There was no significant interaction between PMS and testosterone propionate on pituitary weights.—*W. R. Breneman.* (Biological Abstracts)

CLARK, A. M.
CARBONIC ANHYDRASE ACTIVITY DURING EMBRYONIC DEVELOPMENT. *Jour. Exp. Biol. 28:* 332, September 1951.—

1. Tissue carbonic anhydrase is usually formed at an early stage in the embryonic development of the chick and mouse. The enzyme does not appear in the blood until a relatively late stage has been reached.
2. In the erythrocytes, it is probable that the enzyme is confined to those cells produced in bone marrow.
3. Evidence is presented to support the theory that towards the end of development, there is a replacement of red cells which contain an embryonic type of haemoglobin but no carbonic anhydrase, by corpuscles in which the enzyme is present together with the adult type of haemoglobin. (Experiment Station Record)

CLEGG, R. E., P. E. SANFORD, R. E. HEIN, A. C. ANDREWS, J. S. HUGHES, and C. D. MUELLER.
ELECTROPHORETIC COMPARISON OF THE SERUM PROTEINS OF NORMAL AND DIETHYLSTILBESTROL-TREATED COCKERELS. *Science 114:* 437, October 26, 1951.—These results demonstrate that the injection of diethylstilbestrol will cause changes as-

sociated with egg formation to occur in the serum proteins of male birds. As previously mentioned, similar changes have been noted in the total calcium and phosphorus and in the calcium and phosphorus partition of pigeon serums. From these results it can be concluded that the increase in the serum proteins, which binds the increased calcium in the laying hens so that the total diffusible calcium remains constant, may be caused by the female sex hormone. The properties of the protein fractions found in the serums of normal and estrogen-treated male birds are under investigation. (Experiment Station Record)

COLOMBEL, J.
TOXICITE DES OESTROGENES DE SYNTHESE DANS LA CHAIR DES COQS CASTRES CHIMIQUEMENT. [TOXICITY OF FLESH OF COCKS CHEMICALLY CASTRATED BY SYNTHETIC ESTROGENS.] *Thesis, Univ. Paris,* 1950.—It may be necessary to verify resorption of the "pellet," even enucleate it after effective castration, to prevent any toxic action in human ingestion of meat from treated birds.—*(From review in Rec. Med. Vet. Ecole d'Alfort.)* (Biological Abstracts)

COMMON, R. H., D. G. CHAPMAN and W. A. MAW.
THE EFFECT OF GONADAL HORMONES ON THE NUCLEIC ACID CONTENT OF LIVER AND SERUM IN THE IMMATURE PULLET, AND THE DIFFERENCE BETWEEN THE NUCLEIC ACID CONTENT OF THE LIVERS OF SEXUALLY MATURE PULLETS AND COCKERELS. *Canadian Journal of Zoology 29:* 265, August 1951.—The results suggest that there is a sexual differentiation in the nucleic acid content of the livers of the mature fowl, and that this is reasonably attributable to endogenous estrogen activity. Data are presented in confirmation of the reported effect of estrogen in increasing serum or plasma nucleic acid in the fowl, androgen being without any such effect. (Experiment Station Record)

DANOWSKI, T. S., L. GREENMAN, R. TARAIL, F. M. MATEER, E. N. WARD, and J. S. YOUNGNER.
EFFECT OF CORTISONE UPON CHEMICAL COMPOSITION OF ALLANTOIC FLUID OF THE CHICK EMBRYO. *Proc. Soc. Exp. Biol. Med. 77:* 839, August 1951. (Experiment Station Record)

DRIGGERS, J. CLYDE, RAY L. SHIRLEY, GEORGE K. DAVIS, and N. R. MEHRHOF. (U. Florida, Gainesville.)
THE TRANSFERENCE OF RADIOACTIVE CALCIUM AND PHOSPHORUS FROM HEN TO CHICK. *Poultry Sci. 30:* 199-204. 1951.—Results of analysis of chicks hatched from eggs laid subsequent to oral admn. of Ca^{45} and P^{32} to the laying hens are presented. Appreciable quantities of Ca^{45} (0.40% of that administered) were found in the absorbed yolk sac of chicks hatched from eggs laid one day after admn. of the isotope. Quite probably all of this Ca was acquired from the egg shell. The highest Ca^{45} concn. (1.016% of dose) was found in chicks from eggs laid 2 days after admn. Thereafter, the amt. dropped abruptly and then tended to decline gradually, indicating that the main source of supply was the yolk and white. Concn. of P^{32} reached its peak (0.839% of the dose) in chicks hatched from eggs laid 6 days after admn. of the isotope. When calculated as % dose per mg. of total element, the concns. of Ca^{45} and P^{32} in the various tissues were essentially equivalent, thus indicating that the isotopes were incorporated in direct proportion to the total element assimilated.—*Authors.* (Biological Absracts)

EBERT, J. D.
ONTOGENETIC CHANGE IN THE ANTIGENIC SPECIFICITY OF THE CHICK SPLEEN. *Physiological Zool. 24:* 20, January 1951.—Results of over fifteen hundred precipitin tests indicate that saline extracts of 9-, 12-, and 18-day-old embryonic chick spleen contain, in addition to an antigenic fraction held in common with 18-day and adult

brain, a spleen-specific fraction (SI), identical with, or closely related to, an antigen found in adult spleen. (Experiment Station Record)

EL-IBIARY, H. M., and C. C. SHAFFNER. (U. Maryland, College Park.)
THE EFFECT OF INDUCED HYPOTHYROIDISM ON THE GENETICS OF GROWTH IN THE CHICKEN. *Poultry Sci. 30:* 435-444. 1951.—Expts. were designed to evaluate the role played by the genotype of thyroxine secretion in growing New Hampshire chicks. The assumption is made that inhibition of the thyroidal function through feeding thiouracil to the treated birds is analogous to the induction of a "thyroxineless" phenocopy of the control or normal birds. Hence, by comparing the 2 groups of birds with respect to estimates of heritability and genetic correlations of body wt. and body measurements, it would be possible to account for thyroidal contribution to polygenic variance and covariance. The results show that while inhibition of the thyroid genotype increases the observed phenotypic variability, its effect on genetic variability is inconsistent and dependent upon the character in question.—*Auth. summ.* (Biological Abstracts)

FEDOROVSKII, N. P.
ZOBNOE I ZHELUDOCHNOE PISHCHEVARENIE INDEEK. [CROP AND STOMACH DIGESTION OF HEN TURKEYS.] *Sovetskaia Zootekhniia 1:* 50-58. 1951.—Turkeys have a neuro-muscular mechanism regulating entrance of food into the stomach. When the stomach is empty, food and water may pass directly into it, avoiding the crop, and the crop only begins to fill after the stomach is full. Evacuation of food from the crop into the stomach depends on the degree of emptiness. Saliva of turkeys has an amylolytic enzyme functional in the crop as well as in vitro at 40°C. The stomach glands secrete continuously (about 23 mg. in 30 min.) when the organ is empty. Usually, 2-3 muscular contractions occur per min. Gastric juice of turkeys is strongly acid (pH, 1.47), has free and bound HCl, and digests coagulated serum protein (apparently contains pepsin). Chymosin was rarely found. The empty stomach contains bile, probably due to its regurgitation from the duodenum. The full stomach rarely contains bile. The proteolytic action of the gastric juice increases considerably (sometimes 4-fold) after feeding. A certain regularity of gastric secretion was noted, dependent on the kind of food. Proteolytic activity of the gastric juice is highest after feeding with mixed food including animal food, and lowest after feeding with millet. Mixed grain and animal food is best for stimulation of continual gastric secretion and creates nearly optimal conditions for enzymatic digestion. The mechanical functioning of the hen turkey's stomach depends on the properties of food taken in. Feeding with oats at first retards muscular contractions; mixed animal and vegetable food does not slow down contraction. (Biological Abstracts)

FERREIRA-BERRUTTI, PEDRO
EXPERIMENTAL DEFLECTION OF THE COURSE OF OPTIC NERVE IN THE CHICK EMBRYO. *Proc. Soc. Exp. Biol. Med. 76:* 302, February 1951. (Experiment Station Record)

FOX, THOMAS W. (U. Massachusetts, Amherst.)
STUDIES ON HEAT TOLERANCE IN THE DOMESTIC FOWL. *Poultry Sci. 30:* 477-483. 1951.—A pedigreed population of White Plymouth Rocks and S. C. White Leghorns was submitted to an environmental temp. of 108±0.5°F. without access to drinking water. Survival time in minutes was used as the criterion for relative resistance. The White Plymouth Rock breed had a significantly longer avg. survival time than the S. C. White Leghorn. No significant sire, dam, or sex difference was found by the statistical method used. When drinking water was available the order was reversed with the S. C. White Leghorn breed exhibiting the significantly longer survival time. The greater inclination of the S. C. White Leghorn to continue water consumption during periods of high temp. was felt to be an important consideration in fur-

ther genetic studies involving heat tolerance.—*T. W. Fox.* (Biological Abstracts)

FRAPS, R. M., M. W. OLSEN and S. J. MARSDEN.
AUGMENTATION BY PREGNANT MARES' SERUM OF BODY WEIGHT RESPONSE OF MALE TURKEYS TO TESTOSTERONE PROPIONATE. *Proc. Soc. Expt. Biol. & Med. 77:* 356, June 1951.—Following preliminary treatment with pregnant mares' serum, body weight responses of immature and mature, but sexually inactive, male turkeys to testosterone propionate were considerably augmented when the androgen was administered concurrently with pregnant mares' serum. The serum alone was without appreciable effect on body weight. (Experiment Station Record)

GANGULY, J., and H. J. DEUEL, JR. (U. Southern California, Los Angeles.)
COMPARISON OF DISTRIBUTION OF CAROTENOID COMPONENT IN TISSUES OF SEVERAL SPECIES [CHICKEN, SHEEP, AND COW]. *Fed. Proc. 10:* 383. 1951.—An abstract. (Biological Abstracts)

GILLIS, M. B., and R. J. YOUNG. (Cornell U., Ithaca, N. Y.)
CHOLINE OXIDASE ACTIVITY OF CHICK LIVER TISSUE. *Poultry Sci. 30:* 468-469. 1951.—Choline oxidase activity of chick liver tissue was measured by means of a Warburg respiration apparatus. Chick livers contain a high order of choline oxidase activity regardless of the previous nutritional history of the chicks with respect to vit. B_{12}. —*Auth. summ.* (Biological Abstracts)

HAYS, F. A., and E. W SPEAR. (U. Massachusetts, Amherst.)
VARIATIONS IN SHADES OF SHELL COLOR IN RHODE ISLAND RED EGGS. *Poultry Sci. 30:* 340-243. 1951.—Data were collected on 142 R.I. Red hens to study the shade of shell color of hatching eggs laid during Feb. and Mar. in the 1st and 2d laying yrs. Similar data were secured on 121 hens during their 2d and 3d laying yrs. These data indicate a tendency for avg. shell color to be darker in the 2d laying year. There was no evidence, however, that shell color will change significantly between the 2d and the 3d laying years. Factors that have been shown to be largely responsible for the increase or decrease in shell color are: duration of annual molt, number of days of laying after molt to Feb. 1, and number of eggs laid after molt to Feb. 1. The general assumption is that heavy egg production induces a physiol. exhaustion of pigment cells and that the amt. of depletion may be controlled by inheritance.—*Auth. summ.* (Biological Abstracts)

HAZELHOFF, E. H. (U. Groningen, Netherlands.)
STRUCTURE AND FUNCTION OF THE LUNG OF BIRDS. *Poultry Sci. 30:* 3-10. 1951.—The mechanism of breathing for birds and mammals is very different. Evidence is presented disproving the theories of previous workers on the mechanism of inspiraton and expiration of air.—*Lawrence Morris.* (Biological Abstracts)

HENDERSON, E. W.
HATCHABILITY OF PUREBRED AND CROSSBRED CHICK EMBRYOS. *Mich. Quar. Bul. 34:* 83, August 1951. (Experiment Station Record)

HIXSON, FLOYD M., and R. B. THOMPSON. (Oklahoma A. and M. Coll., Stillwater.)
THE USE OF ESTROGENS FOR IMPROVING THE MARKET FINISH OF TURKEYS IN HOT WEATHER. *Poultry Sci. 30:* 393-395. 1951.—Two estrogenic compounds, triphenylchloroethylene and triphenylbromoethylene, were fed to lots of 22- to 24-week-old turkeys at the rate of 320 mg./lb. of feed and 250 mg./lb. of feed, respectively. The birds were fed on the range for 19 days. Finish (fat) was increased

and the incidence of pinfeathers was lessened in the estrogen-fed males. Finish was not increased in the females, but the incidence of pinfeathers was lessened. Some loss of quality in females occurred, due to excessive treading, as the sexes were not separated. Marked retardation of gains in wt. of males in the estrogen-fed lots, as compared with the controls, makes the practice of questionable value where birds are sold solely on a wt. basis.—*F. M. Hixson.* (Biological Abstracts)

JOSEPHSON, E. S., D. J. TAYLOR, J. GREENBERG, and A. P. RAY.
A METABOLIC INTERMEDIATE OF PAMAQUINE FROM CHICKENS. *Proc. Soc. Exp. Biol. Med. 76:* 700, April 1951. (Experiment Station Record)

KRITCHEVSKY, DAVID, C. R. GRAU, B. M. TOLBERT, and BARBARA J. KRUECKEL. (U. California, Berkeley.)
DISTRIBUTION OF RADIOACTIVITY IN THE EGG AFTER FEEDING SODIUM ACETATE-1-C^{14}. *Proc. Soc. Exptl. Biol. and Med. 76:* 741-743. 1951.—Na acetate-1-C^{14} (9.55 mc) was fed, in 3 feedings, to a Single Comb White Leghorn hen. Eggs were collected for 7 days and after sacrificing the hen, 2 large ova were isolated and all smaller ova combined, giving 3 additional fractions. The separate shells, albumens and yolks were dried and converted to CO_2 by dry combustion. The CO_2 was collected and assayed for radioactivity as $BaCO_3$. Activity was present in all shells, albumens, yolks and ova. Activity of shells was roughly constant except for eggs laid within 24 hrs. after a feeding, when it was higher. Activity range for shells: low, egg 1 (4.8 μc); high, egg 4 (33.4 μc). Yolk and albumen activities increased with time. Activity range for albumen: low, egg 1 (0.2 μc); high, egg 5 (11.3 μc). For yolks: low, egg 1 (1.4 μc); high, egg 7 (113.6 μc). Yolk 5 showed irreguar, low activity which may be due to error in marking or combustion. This is being investigated. Activity recovered: 11.62 μc (1.21%) shells: 43.8μc (0.46%) in albumens; 495.5 μc (5.18%) in yolks.—*David Kritchevsky.* (Biological Abstracts)

LANNI, F., and YVONNE THERY LANNI.
INTERPRETATION OF VIRUS-INDUCED CHANGES IN THE SHAPE OF HEMAGGLUTINATION-INHIBITION CURVES WITH EGG-WHITE INHIBITOR. *Science 114:* 546, November 23, 1951. (Experiment Station Record)

LEE, W. H.
THE GLYCOGEN CONTENT OF VARIOUS TISSUES OF THE CHICK EMBRYO. *The Anatom. Rec. 110:* 465, August 1951. (Experiment Station Record)

MORRIS, DAVID M. (Indiana U., Bloomington.)
THE INFLUENCE OF THYROID HORMONE AND ANDROGEN ON COMB GROWTH IN THE WHITE LEGHORN COCKEREL. *Endocrinology 48:* 257-263. 1951.—Expts. with White Leghorn cockerels involving restricted diet, thyroidectomy, castration, testosterone propionate injns., thiouracil admn., and various combinations of these treatments revealed a dependence of comb growth on thyroid hormone as well as androgens. Data on comb, gonad, and thyroid wts. are discussed in support of the thesis that the influence of androgen and thyroid hormone on comb growth is a synergistic one.—*D. M. Morris.* (Biological Abstracts)

NALBANDOV, A. V., R. K. MEYER and W. H. McSHAN.
THE ROLE OF A THIRD GONADOTROPHIC HORMONE IN THE MECHANISM OF ANDROGEN SECRETION IN CHICKEN TESTES. *The Anatom. Rec. 110:* 475, August 1951. (Experiment Station Record)

NICKERSON, W. J., and R. D. RADELEFF.
EFFECTS OF INHALATION OF CHLORDANE VAPORS UPON YOUNG CHICKENS. *Vet. Med. XLVI:* 314, August 1951.—Under the

conditions of this experiment, no ill effect was observed in young chickens exposed continuously for 30 days to the vapors arising from surfaces treated with 1,000 mg. of chlordane per square foot. (Experiment Station Record)

OLSEN, MARLOW W., and RICHARD M. FRAPS. (U.S. Dept. Agric., Beltsville, Md.)

MATURATION CHANGES IN THE HEN'S OVUM. *Jour. Exptl. Zool. 114:* 475-489. Illus. 1950.—A study was conducted to determine the time when the final maturation changes occur in the hen's egg as indicated by the disintegration and subsequent disappearance of the germinal vesicle. Normally laying hens (4 or more birds to a group) were sacrificed at 2.5, 4.5, and 6.5 hour intervals before time of expected ovulation. Other groups of hens (4 or more birds in each group) were injected with 0.5 mg. of dried anterior pituitary powder from male chickens to bring about premature ovulation. These hens were then killed at intervals at 2, 4, and 6 hours after time of injection. The follicles due to ovulate were removed, fixed in Bouin's and sections made of the germinal disc. Microscopic examination of the germinal disc of mature ovarian follicles from both normally laying birds and those in which ovulation was induced experimentally revealed that the onset of maturation changes occurs approx. 4.5 hours before time of ovulation. In most ova the germinal vesicle had completely broken down and the first polar body had been extruded by at least 2.5 hours prior to time of expected ovulation. It is concluded that the same hormone which induces ovulation, either normally or experimentally, brings about the final maturation changes of the hen's ovum. This action, however, is not necessarily a direct one.—*Auth.* (courtesy Wistar Bibl. Serv.).

PAREDES, J. R. (Veterinary College, Madrid)

ACCION DEL TIROIDES SOBRE LA ACTIVIDAD SEXUAL Y GONADICA EN LAS AVES. *Tirada aparte de Anales de la Sociedad Veterinaria de Zootecnia 5. No. 3 Fasc. 31:* 33.

SUMMARY

We have carried out partial and total ablations of the thyroid gland in fowl of the black Castellana race and different ages. The results obtained have been gathered in the Tables and Lists we join to our work. From the study of the said tables we can deduce that the delay from the females in beginning to lay depends on the age at which the ablation of the thyroid has been carried out, in those cases of a total ablation, or of the degree of same in the cases of a partial ablation. We can also observe in the males a delay in the appearance of the morphological and functional manifestations connected with sexuality and we can clearly observe that the effects are similar to those present in the females. We have taken as the starting point of sexuality in males the date of the first copulating and the frequency of same.—*Author.*

ROBERTS, E., D. A. KARNOFSKY and S. FRANKEL.

INFLUENCE OF CORTISONE ON FREE HYDROXYPROLINE IN THE DEVELOPING CHICK EMBRYO. *Proc. Soc. Exp. Biol. Med. 76:* 289, February 1951. (Experiment Station Record)

RODBARD, S. L., L. N. KATZ, C. BOLENE, R. PICK, M. LOWENTHAL, and G. GROS. (Michael Reese Hosp., Chicago.)

THE AGE FACTOR IN HYPERCHOLESTEREMIA AND ATHEROMATOSIS IN THE CHICK. *Circulation 3:* 867-874. 1951.—The problem of the relation of arterial aging and injury to the development of atheromatosis was investigated by utilizing newly hatched chicks given a diet supplemented with 2% cholesterol and oil (2CO). Hypercholesteremia occurs in the chick during embryonic life. However, no atheromas were found in newly hatched chicks. This may be dependent on a specific resistance to atherogenesis during the prenatal period. Atheromatosis was produced in the 2CO chick as early as the 5th week of life. These results cast doubt upon the concept that arterial aging and/or injury is a necessary precondition for the development of arteriosclerosis. The facility with which hypercholesteremia and atheromatosis developed depended in large part upon the age period of the

2CO chick. Chicks were found to be generally resistant to hypercholesteremia and atherogenesis during the first 8 weeks of life. At about 8 weeks of age, corresponding to early puberty, a spontaneous increase in the plasma cholesterol occurs when the animals are on a cholesterol-enriched diet. Atherogenesis proceeds rapidly within the 3-4 weeks after the spontaneous rise in plasma cholesterol with the development of severe lesions by the 12th week of life. Spontaneous variations in the regulation of plasma cholesterol are also seen at about the 22d week, at the time of sexual maturation. These expts. demonstrate that endogenous factors dependent upon the age period of the animal play an important role in the regulation of cholesteremia and atherogenesis in the cholesterol-fed chick.—*Auth. summ.* (Biological Abstracts)

ROMIJN, C.

STOFWISSELINGSONDERZOEK BIJ DE KIP. [METABOLISM IN THE HEN.] *Tijdschr. Diergeneesk. 75:* 719-746. 1950.—The effect of age and body size appears to be very pronounced. Up to 3 weeks (150 g.) the caloric production per unit of body wt. increases steadily from about 10 to 15 cal. From this age on to the adult state a decrease from 15 to 3 cal./kg. body wt./hr. could be established. In poorly feathered animals the calorie production surpasses the normal by about 100%. In fasting animals the daily variations in metabolism appeared to be very small. Food supply is immediately followed by an increase in calorie production of about 20%. In 4-wk. old chickens the influence of food is much more pronounced than in mature hens. Temp. and humidity greatly affect the metabolism in relation to the feathering. In adults cooling of the surrounding air below 32°C. has little influence on the calorie production. At 5°C. the metabolism surpasses that at 32°C. by only 50% while heating from 32° to 38°C. is followed by an increase of 100%. Therefore, 32°C. is the critical temp. of adult North Holland Blue hens and cocks. Poorly feathered animals have a much better adaptation to higher environmental temp. than normally feathered animals, thanks to the greater amt. of heat given off by radiation. Above the critical temp. the influence of the humidity is highly pronounced. Sparsely feathered animals maintain the physiological level of body temp. (41-42°C.) in dry surrounding air even at an environmental temp. of 38°C.—*K. Büchli.* (Biological Abstracts)

SKOGLUND, W. C. (U. New Hampshire, Durham.), **A. E. TOMHAVE, and C. M. MUMFORD.** (U. Delaware, Newark.)

EGG WEIGHT IN NEW HAMPSHIRES HATCHED EACH MONTH OF THE YEAR. *Poultry Sci. 30:* 452-454. 1951.—Birds hatched in all months except Oct., Nov. and Dec. produced, on a yearly production basis, over 86% large eggs. April, May, June, Aug. and Sept. hatches produced over 93% large eggs. The hatches with the poorest avg. egg wt. had a higher % of small eggs over a longer period of time. Reasons suggested are: (1) In the poorer hatches, production started during the warmer months. The hatches with the best egg wt.-records started production during the cooler months. (2) The hatches with the poorest yearly avg. egg wt. also had the earliest sexual maturity.—*W. C. Skoglund.* (Biological Abstracts)

SMOLELIS, A. N., and S. E. HARTSELL.

OCCURRENCE OF LYSOZYME IN BIRD EGG ALBUMINS. *Proc. Soc. Exp. Biol. Med. 76:* 455, March 1951.—These results indicate the distribution and quantitative variation of this enzyme in egg albumins. There is variation between species of birds in the lysozyme content of their eggs. (Experiment Station Record)

STAMLER, J., and L. N. KATZ. (Michael Reese Hosp., Chicago.)

THE EFFECT OF "SALT" HYPERTENSION ATHEROSCLEROSIS IN CHICKS FED MASH WITHOUT A CHOLESTEROL SUPPLEMENT. *Circulation 3:* 859-863. 1951.—"Salt" hypertension has little or no effect on spontaneous atherogenesis in the abdominal aorta of chicks fed mash without a cholesterol supplement. In such birds, "salt"

hypertension does not lead to the development of gross lesions in the thoracic aorta of the cholesterol-induced type.—*Auth. summ.* (Biological Abstracts)

STURKIE, PAUL D. (Rutgers U., New Brunswick, N. J.)
EFFECTS OF ESTROGENS AND THYROXINE UPON PLASMA PROTEINS, BLOOD VOLUME AND HEMATOCRIT OF THE FOWL. *Fed. Proc. 10:* 134. 1951.—*An abstract.* (Biological Abstracts)

WALKER, HARRY A. (Emory U., Ga.), **M. WIGHT TAYLOR, and WALTER C. RUSSELL.**
THE LEVEL OF INTERRELATIONSHIP OF THE PLASMA LIPIDS OF THE LAYING HEN. *Poultry Sci. 30:* 525-530. 1951.—Total plasma lipids of laying hens fed a normal all-mash ration averaged 1476 mg./ml. (range 652 to 2308 mg.). Phospholipid, neutral fat and total cholesterol constituted approx. 30, 62 and 7%, respectively, of the lipid material. In abnormal cases, the blood plasma contained up to 13% of total lipids but despite this enormous increase, the relationship among the various lipid constituents was not markedly changed. On a low-fat ration there was a slight decrease in total lipids, but a high-fat ration produced no changes. The relationship among the lipid constituents was almost identical on the normal, high-fat and low-fat rations.—*M. W. Taylor.* (Biological Abstracts)

WEISS, H. S., and P. D. STURKIE. (Rutgers U., New Brunswick, N. J.)
AN INDIRECT METHOD FOR MEASURING BLOOD PRESSURE IN THE FOWL. *Poultry Sci. 30:* 587-592. Illus. 1951.—The equipment consists of a 1-inch pressure cuff, which is placed around the bird's thigh. As the cuff is inflated the pulse in the shank disappears and its reappearance after the slow deflation signals the systolic blood pressure. The pulse is picked up by a Statham strain gage attached to shank and recorded by a Brush direct-writing oscillograph. An alternative pick-up method involves the use of a carbon granule microphone and the re-appearance of the pulse after deflation is indicated by the movement in the needle of the galvanometer. The latter method is not as accurate as the gage set-up. The gage indirect method was compared with the strain gage direct method and was found to agree within 3.2 mm. Hg, a difference which is not statistically significant. Diastolic pressures can be detd. in some cases, but not all. The avg. systolic blood pressure of 18 adult White Leghorn hens, detd, indirectly, was 148 ± 14.4.—*P. D. Sturkie.* (Biological Abstracts)

WILLIAMS, C., GEORGE F. GODFREY, and R. B. THOMPSON. (Oklahoma Agric. Expt. Sta., Stillwater.)
THE EFFECT OF RAPIDITY OF HATCHING AND GROWTH, EGG PRODUCTION, MORTALITY, AND SEX RATIOS IN THE DOMESTIC FOWL. *Poultry Sci. 30:* 599-606. 1951.—Data were collected on chicks and pullets of the station strain of New Hampshire fowl and simple correlation coeffs. calculated to determine the effect of rapidity of hatching on productive qualities. Chicks were hatched from eggs that were weighed prior to setting and hatched in individual baskets. 7 emergent periods spaced 8 hrs. apart and beginning on the 20th day were used. Early emerging chicks grew slightly faster than late emerging chicks if they were removed from the incubator and given feed and water soon after hatching. Early emerging pullet chicks matured sexually slightly faster and laid a few more eggs than late emerging pullets. No relationship between rapidity of hatching and mortality was evident. Female chicks predominated during the first half of the hatch and males predominated during the last half. The larger the egg, the longer the time required for it to hatch.—*C. C. Brunson.* (Biological Abstracts)

WILSON, WILBOR O., and THEODORE H. PLAISTER. (U. California, Davis.)
BREED DIFFERENCES IN HEAT TOLERANCE OF DAY-OLD BABY CHICKS. *Poultry Sci. 30:* 625-627. 1951.—Day-old chicks kept in sealed shipping boxes showed high mortality when the boxes were

kept in an ambient temp. of 100°F. Chicks of the New Hampshire breed were more susceptible to death from overheating than White Leghorns. —*W. O. Wilson.* (Biological Abstracts)

BIOPSY NEEDLE USED IN POULTRY STUDIES. North Carolina's *Research & Farming 8:* 9, Spring 1950. 72nd. Annual Report.—The Turkey bone marrow needle, already widely used in human surgery, is now being used to remove bone marrow from poultry. The extremely dense bones of chickens and turkeys are hard to drill and require a needle made of especially tough tool steel. (Experiment Station Record)

CONTROL TURKEY FEATHERS. *Science News Letter 60:* 260, October 27, 1951. (Experiment Station Record)

NUTRITION

BACZIOWSKA, HELENA, and JOZEF SKULMOWSKI. (U. Lublin, Poland.)
ZDOLNOSC WYKORZYSTYWANIA PASZY PRZEZ KURCZETA ROZNYCH RAS I OPLACALNOSC ICH WYCHOWU. [THE CAPACITY OF CHICKS OF VARIOUS RACES TO UTILIZE THE FEED AND THE PROFITABILITY OF THEIR BREEDING.] *Ann. Univ. Mariae Curie-Sklodowska Sect. DD Vet. Med. 5:* 325-339. Illus. 1950.—Chicks of the native Zelononozka breed gain weight better than those of the Sussex breed. Hybrids chicks of which the father was a Zelononozka gained wt. better than the others.—*L. I. Hallay.* (Biological Abstracts)

BECHTEL, H. E.
HOW FAR CAN YOU TRAVEL ON ANTIBIOTICS? *Feedstuffs 23:* 18, August 11, 1951.—Thus, the approximately 16,000 broilers in the Fayetteville, Ark., C-O-T finals this year at 10 weeks of age reportedly averaged 2.58 lb. feed efficiency and 3.06 lb. body weight, which means a B value of 1.19; the best birds at 10 weeks had a 2.62 feed efficiency and a 3.52 body weight, or a B value of 1.34 for the pen. The 12-week winning body weights at the C-O-T finals were 3.56 lb. per bird in 1948 and 4.27 in 1951.

No matter how phenomenal some of these results may appear to the rank and file poultry breeder and hatcheryman, there are plenty of signs that even bigger developments lie ahead. For instance, research data more than a year ago were turning up occasional chicken broilers weighing as much as 6.15 lb. at 12 weeks of age. Just a few days ago we weighed out a 10-week pen of white hybrid males with a feed efficiency of 2.58 lb. and a body weight of 4.11 lb. feed equal to a 1.59 B value; the biggest male, by the way, tipped the scales at 5.44 lb. body weight at 10 weeks of age. (Experiment Station Record)

BERG, L. R. (Western Washington Expt. Sta., Puyallup, Wash.)
ANTIBIOTICS IN FEED FOR BROILERS. *Feedstuffs* [*Minneapolis*] *23:* 31-33. 1951.—With antibiotics it is posisble to produce a 3.5-lb. bird with the same amt. or less feed per lb. of gain than was possible without antibiotics. Antibiotics do not promote the same % increase in rate of gain in different spp. of animals or even in all spp. of fowl. In rapidly growing fryers, increases of 10-15% have been obtained. Better gains are obtained when fish meal is used than with all-vegetable type rations. There may be differences in type of fish meal, also. In some cases, 2% of herring fish meal has produced as much response as higher levels, up to 7%, but the U.S.D.A. is recommending 5% of a 70% fish meal for fryer rations. Total protein in the ration was recommended at 21%, but this has been reduced to 20%. In some instances penicillin and bacitracin have produced better results than aureomycin or terramycin, but this has not been consistent, and combinations of antibiotics have not promoted better growth than penicillin alone.—*H. L. Wilcke.* (Biological Abstracts)

BETHKE, R. M., and D. C. KENNARD
NO RESPONSE FROM ADDING PANTOTHENIC ACID OR NIACIN TO BROILER TYPE RATION. *Ohio's 69th Annual Report, Farm Science and Practice,, Bul. 705,* June 1951, p. 74.—Although pantothenic acid and niacin are essential in poultry nutrition, no improvement in growth or feed utilization to 8 weeks was noted when these vitamins were added separately or in combination to a broiler-type ration.

Apparently the ingredients used in the ration supplied adequate amounts of pantothenic acid and niacin. (Experiment Station Record)

BIELY, J., B. E. MARCH, G. L. INKIN, and G. T. EEDY. (U. British Columbia, Vancouver, B. C., Canada.)
WHEAT VERSUS CORN IN THE CONNECTICUT BROILER RATION. *Poultry Sci. 30:* 593-598. 1951.—A series of feeding tests has been conducted with various modifications of the Connecticut broiler ration. The results of these tests were as follows: From 75 to 100% of the corn in the Connecticut broiler ration was replaced by wheat on a pound-for-pound basis without altering the growth promoting value of the ration. When the protein content of the ration was balanced to adjust for the difference in the protein content between wheat and corn, through lowering the amt. of supplementary protein concentrates, the rate of growth was lowered. Replacement of the meat meal and soybean oil meal in the Connecticut broiler ration with fish meal as the sole protein supplement resulted in lower rates of growth. The lower rates of growth obtained with the wheat rations in which the protein content was adjusted to that of the corn rations may have been due to the lowered amt. of supplementary protein and to the fact that only a single source of supplementary protein was used. The inclusion of an A.P.F. supplement containing aureomycin increased the growth rate of chicks fed the original Connecticut broiler ration and modifications thereof. No. 1 recleaned ground feed screenings was used to replace one-third of the corn in the Connecticut broiler ration on a pound for pound basis without lowering the growth rate. However, the addition of 66 and 100% of No. 1 recleaned ground feed screenings in place of corn resulted in lower growth. By adding A.P.F. supplements containing aureomycin, the rates of growth of chicks fed the rations containing screenings were similar to those obtained with the corn ration also containing this supplement. The efficiency of feed utilization was, however, somewhat lower with the rations containing screenings.—*Auth. summ.* (Biological Abstracts)

BIELY, JACOB, B. MARCH, JOAN STEVENS, and R. CASORSO. (U. British Columbia, Vancouver, Canada.)
A.P.F. SUPPLEMENTS IN THE CHICK RATION. *Poultry Sci. 30:* 143-145. 1951.—Trials were set up to determine the effect of A.P.F. supplements on the growth rate and feed efficiency of chicks fed varying levels of protein, as well as all vegetable proteins supplemented with fish meal. Chicks were used that were hatched from breeders fed an adequate breeder ration. Results indicated a difference in A.P.F. supplements and their effect on growth and feed efficiency, and that other factors in addition to the A.P.F. were affecting the results.—*Lawrence Morris.* (Biological Abstracts)

CARVER, J. R. (State Coll. Washington, Pullman.)
ANTIBIOTICS IN FEEDS FOR LAYING HENS. *Feedstuffs [Minneapolis] 23:* 18. 1951.—White Leghorn pullets were fed a basal ration, basal plus 10 ppm. terramycin, basal plus 10 ppm. aureomycin, basal plus 3% herring fish meal plus 10 ppm. terramycin, and basal plus 3% herring fish meal plus 10 ppm. aureomycin. All lots were supplemented with 5 gamma of Vitamin B_{12} per kg. This is a preliminary report of the first five 28-day periods, but there has been to date no effect of the antibiotics on egg wt., body wt., egg production or mortality. Mortality has been low in all lots. The Western Washington Station is working with levels of 0, 4, 8, and 12 ppm. of terramycin in a similar test.—*H. L. Wilcke.* (Biological Abstracts)

COMAR, C. L. and O. E. GOFF.
RADIOACTIVITY AIDS POULTRY RESEARCH; ATOMIC MATERIALS USED IN NUTRITION EXPERIMENTS. *The Feed Bag 27:* 27, October 1951. (Experiment Station Record)

COMBS, G. F.
GREEN MANGANOUS OXIDE AS A SOURCE OF MANGANESE FOR POULTRY. *Feedstuffs 23:* 54, August 11, 1951.—Green manganous oxide can be used as a satisfactory source of manganese in poultry rations.

One tenth of a pound per ton of green manganous oxide will supply a level of available manganese comparable to that which would be supplied by ¼ lb. per ton of commercial grade manganese sulfate. This level of green manganous oxide would supply approximately 55 parts per million of manganese in the ration. (Experiment Station Record)

COUCH, J. R., J. F. ELAM, and L. L. GEE. (Texas Agric. Exp. Sta., Coll. Sta., Tex.)
EFFECT OF PENICILLIN ON GROWTH, EGG PRODUCTION AND HATCHABILITY. *Fed. Proc. 10:* 379. 1951.—An abstract. *(Biological Abstracts)*

CRAVENS, W. W., H. W. BRUINS, M. L. SUNDE, and E. E. SNELL. (U. Wisconsin, Madison.)
EVIDENCE OF TWO UNIDENTIFIED FACTORS REQUIRED BY THE CHICK. *Fed. Proc. 10:* 379. 1951.—*An abstract.* (Biological Abstracts)

DAVIS, R. L., E. G. HILL, H. J. SLOAN, and G. M. BRIGGS. (U. Minnesota, St. Paul.)
DETRIMENTAL EFFECT OF CORN OF COARSE PARTICLE SIZE IN RATIONS FOR CHICKS. *Poultry Sci. 30:* 325-328. 1951.—A study was made on the self-selection of corn in rations for chicks. Replacement of various amts. of ground corn in a starting mash by finely cracked corn resulted in significantly depressed growth and decreased utilization of feed. This was attributed to the selection of the corn particles by the chick to the exclusion of the rest of the diet. With a corn-soybean starting mash, chicks did not balance their diet if they were allowed access to ground corn other than that in the starting mash. Approx. 50% less growth occurred when the ground corn was removed from this mash and fed free choice.—*Authors.* (Biological Abstracts)

DIETRICH, L. S., W. J. MONSON, and C. A. ELVEHJEM.
OBSERVATIONS ON A RELATIONSHIP BETWEEN VITAMIN B_{12}, FOLIC ACID AND THE CITROVORUM FACTOR. *Proc. Soc. Expt. Biol. & Med. 77:* 93, May 1951.—Vitamin B_{12} injected at low levels increased the PGA stored in chick liver tissue. Higher levels of injected vitamin B_{12} suppressed the liver storage of PGA. Vitamin B_{12} administered orally, increased the level of both PGA and LCF as measured by chick liver storage.

ELAM, J. F., L. L. GEE, and J. R. COUCH. (Texas A. and M. Coll., College Station.)
EFFECT OF FEEDING PENICILLIN ON THE LIFE CYCLE OF THE CHICK. *Proc. Exptl. Biol. and Med. 77:* 209-213. 1951.—The feeding of penicillin stimulated the growth of birds fed an all-vegetable protein diet. Injn. of the antibiotic into the birds fed the basal diet stopped the mortality and appeared to stimulate the growth. Eggs were obtained from all groups. Pullets fed penicillin and injected with vit. B_{12} had the highest egg production. Hatchability of eggs from birds injected with B_{12} was within the normal range. No live chicks were obtained from pullets injected with penicillin from the 14th week. A 39% hatch was obtained from the eggs of pullets fed penicillin continuously. The B_{12} content of the liver and kidney tissues and of the egg yolks was directly related to the injection of the vitamin into the birds. Feeding of penicillin caused a significant increase in the total number of

intestinal microorganisms as indicated by thioglycollate counts. Pencillin likewise caused a significant increase in the number of enterococci of the intestine during the first 14 weeks of the expt. The admn. of penicillin either orally or intraven. resulted in a marked increase in the number of penicillin-resistant micro-organisms in the intestinal tract.—*J. R. Couch.* (Biological Abstracts)

GAINES, D. S., H. P. BROQUIST, and W. L. WILLIAMS.
CERTAIN RELATIONSHIPS BETWEEN PTEROYLGLUTAMIC ACID, CITROVORUM FACTOR, AND CORTISONE. *Proc. Soc. Expt. Biol. & Med. 77:* 247, June 1951.—Cortisone was found to replace pteroylglutamic acid and citrovorum factor for growth of *Streptococcus faecalis* and *Leuconostoc citrovorum*, respectively Cortisone reversed the growth inhibition of *Le. citrovorum* produced by toxic amounts of Aminopterin. (Experiment Station Record)

GILLIS, M. B. and L. C. NORRIS.
METHYLATION OF HOMOCYSTINE BY CHICKS DEFICIENT IN VITAMIN B_{12}. *Proc. Soc. Expt. Biol. & Med. 77:* 13, May 1951.—Chicks very deficient in vitamin B_{12} grew as well when homocystine and betaine were added to a methionine-deficient diet as when a comparable amount of methionine was added. It appears likely that when the chick's diet lacks methyl groups vitamin B_{12} is concerned in the synthesis of such groups and their combination with homocystine to form methionine. Formation of methionine by this procedure, however, is limited and insufficient to meet the needs of the chick. (Experiment Station Record)

GILLIS, M. B., L. C. NORRIS, and G. F. HEUSER. (Cornell U., Ithaca, N. Y.)
THE INFLUENCE OF PARTICLE SIZE ON THE UTILIZATION OF PHOSPHATES BY THE CHICK. *Poultry Sci. 30:* 396-398. 1951.—Two defluorinated phosphates were screened through selected sieves to obtain samples of particles ranging from small pebble size (-8, +10), to a very fine powder (-200). These samples were used as the only source of supplementary Ca and P in a purified diet very deficient in these elements. The effect of particle size on the efficiency with which chicks utilized these phosphates was measured by growth response, percentage of ash in bones, and the occurrence of symptoms of rickets. Samples ground sufficiently fine to pass through a No. 20 sieve but which were entirely retained by a No. 40 sieve were utilized as effectively as samples ground much finer. The more soluble product was approx. as efficient when the sample particles were even larger (-8, +10). Both of the defluorinated phosphates used in this study were excellent sources of Ca and phosphates for the chick.—*Auth. summ.* (Biological Abstracts)

HEUSER, G. F., and L. C. NORRIS. (Cornell U., Ithaca, N. Y.)
AN UNKNOWN NUTRITIVE FACTOR IN FEEDS OF ANIMAL ORIGIN. *Poultry Sci. 30:* 470-471. 1951.—In 6 expts. the increase in growth in all the lots of chicks was in favor of those which received feeds of animal origin. Since the basal ration contained adequate amts. of known vitamins (including vit. B_{12}) it is evident that the animal products give a growth response due to some as yet unknown nutritive factor. There is some evidence, however, to indicate that some of the growth stimulus due to animal protein feeds can be obtained by the feeding of antibiotics.—*G. F. Heuser.* (Biological Abstracts)

HEYN, G.
BEOBACHTUNGEN UBER DIE WIRKUNG VON T-VITAMIN (GOTSCH) BEI HUHNERN. [OBSERVATIONS OF EFFECT OF VITAMIN T ON CHICKEN.] *Zeitschr. Vitamin-, Hormon, u. Fermentforsch. 4:* 121-136. Illus. 1951.—Up to the 8th week of their lives chickens fed vit. T show a wt. increase of about 23% as compared with controls. This increase continues up to the 12th week. At the time of puberty the difference in weight of the 2 groups is only 4.4%. Chickens fed vit. T began to lay earlier than controls even though they only received the vit. up to the 21st week. The avg. wt. of the eggs is greater so that at

the end of the first year the T-birds have laid about 25% more eggs by wt. than the controls. The 1st generation progeny showed no differences up to the 6th week after hatching. T-effect is greater with younger birds than with older ones. When given good food the addition of the T causes an increase in weight.—*A. Radermacher.* (Biological Abstracts)

HILL, E. G., and G. M. BRIGGS. (U. Minnesota, St. Paul.)
REPLACEMENT OF PTEROYLGLUTAMIC ACID BY FOLINIC ACID FOR THE CHICK. *Soc. Exptl. Biol. and Med. 76:* 417-418. 1951. —Chicks were fed a synthetic type diet low in folic acid. Synthetic folinic acid was shown to be able to replace pteroylglutamic acid in the diet at approx. equal levels.—*G. M. Briggs.* (Biological Abstracts)

INGRAM, G. R., W. W. CRAVENS, C. A. ELVEHJEM, and J. G. HALPIN. (U. Wisconsin, Madison.)
THE METHIONINE REQUIREMENT OF THE LAYING HEN. *Poultry Sci. 30:* 431-434. 1951.—A quantitative estimation of the requirement of the laying and breeding hen for methionine was made, using peanut meal supplemented with lysine and tryptophan as the source of protein. Not more than 0.38% methionine in the presence of 0.25% cystine was required. Microbiological amino acid detns. showed no relation between the methionine content of the hen's ration and the methionine content of the egg protein. Hatchability was not affected by a methionine deficiency.—*Auth. summ.* (Biological Abstracts)

INGRAM, G. R., W. W. CRAVENS, C. A. ELVEHJEM, and J. G. HALPIN. (U. Wisconsin, Madison.)
STUDIES ON THE LYSINE AND TRYPTOPHAN REQUIREMENTS OF THE LAYING AND BREEDING HEN. *Poultry Sci. 30:* 426-430. 1951.—A quantitative estimation of the requirement of the laying hen for lysine and tryptophan has been made, using a ration with corn and corn gluten meal as sources of protein. It was found that the requirement of the laying hen for L-tryptophan does not exceed 0.15% of the ration and that for L-lysine does not exceed 0.52% of the ration. —*Auth. summ.* (Biological Abstracts)

KODRAS, R., W. T. COONEY, and J. S. BUTTS. (Oregon State Coll., Corvallis.)
CHICK GROWTH DEPRESSING FACTOR IN SUN-CURED AND DEHYDRATED ALFALFA MEALS. *Poultry Sci. 30:* 280-292. 1951.—A depressing effect on the growth of chicks was obtained with the 3 alfalfa meals (sun-cured, early sun-cured and dehydrated) fed at the 20% level. There was no difference between the growth of chicks on the rations containing dehydrated or early sun-cured alfalfa meal. Growth of chicks on normal sun-cured alfalfa was less than on the other two meals. The same relative results were obtained when the alfalfa meals were compared on an ad libitum feeding program or an equalized feeding program. Expts. have also shown that supplementing a ration containing 20% dehydrated alfalfa with 5 times the recommended allowances of vit. A, thiamin, riboflavin, vit. D_3, pantothenic acid, pyridoxin, niacin, choline, folic acid, and alpha-tocopherol were ineffective in counteracting the chick growth depressing effects of alfalfa. Also chicks which received the basal ration grew faster than chicks which received the same amt. of basal ration plus an additional 20% feed intake of dehydrated alfalfa. The major depressing effects of alfalfa should not be attributed to fiber level or unpalatability but to one or more growth depressing factors. Supplementing a ration containing 20% dehydrated alfalfa with 1% cholesterol counteracted the growth depressing material in alfalfa. Glycerol, butanol and octanol were ineffective. It is concluded that some component of alfalfa, possibly a saponin, is largely responsible for the growth depressing action of alfalfa at the 20% level. —*Auth summ.* (Biological Abstracts)

KRATZER, F. H., D. E. WILLIAMS, and BLANCHE MARSHALL. (U. California, Davis.)
THE TRYPTOPHAN REQUIREMENTS OF YOUNG TURKEY POULTS. *Jour. Nutrition 43:* 223-233. Illus. 1951.—Young turkey poults were fed various levels of L-and DL-tryptophan added to rations containing suboptimum levels of tryptophan. Approx. 0.26% L-tryptophan was required for optimum growth when gelatin and casein or oxidized casein were used as protein sources. When corn gluten feed, meat scrap and gelatin, or corn gluten feed and gelatin were used, the requirement was approx. 0.23% and 0.19%, respectively. D-tryptophan was approx. 30% as active as L-tryptophan in promoting growth in poults.—*Auth.* (courtesy Wistar Bibl. Serv.).

KRATZER, F. H., C. R. GRAU, MORTIMER P. STARR, and D. M. REYNOLDS. (U. California Coll. Agric., Davis and Berkeley.)
GROWTH-PROMOTING ACTIVITIES OF ANTIBIOTICS AND YEAST CULTURES FOR CHICKS AND TURKEY POULTS. *Fed. Proc. 10:* 386. 1951.—*An abstract.* (Biological Abstracts)

KRATZER, F. H., and D. E. WILLIAMS. (U. California, Davis.)
SAFFLOWER OIL MEAL IN RATIONS FOR CHICKS. *Poultry Sci. 30:* 417-421. Illus. 1951.—A decorticated solvent-processed safflower oil meal containing approx. 50% protein was used at various levels in a practical type chick ration in 6 expts. Lysine and methionine were required to supplement mixtures of safflower oil meal and soybean oil meal to give optimum growth. Safflower oil meal and fish meal produced optimum growth but combinations of safflower oil meal with peanut oil meal, sesame oil meal and meat scrap were unsatisfactory. Autoclaving safflower oil meal did not improve growth but increased the density of the feed and prevented pasted beaks in the chicks.—*F. H. Kratzer.* (Biological Abstracts)

KENNARD, D. C., R. M. BETHKE and V. D. CHAMBERLIN.
SUPPLEMENTS TO ALL-PLANT DIET FOR PRODUCTION OF HATCHABLE EGGS. *Ohio's 69th Annual Report, Farm Science and Practice,* Bul. 705, June 1951, p. 71.—These tests indicate that good egg production and satisfactory hatchability may be obtained by use of the all-plant ration fed to hens on the built-up litter. (Experiment Station Record)

KENNARD, D. C. and V. D. CHAMBERLIN.
BUILT-UP LITTER EXPERIMENTS. *Ohio 69th Annual Report, Farm Science and Practice,* Bul. 705, June 1951, p. 70.—Three experiments involving a total of 6,000 chicks for study of growth and dietary requirements indicated that (1) chicks raised on old litter with the all-plant ration made greater gains and had less mortality than chicks with the same ration on new built-up litter; (2) the all-plant ration supplemented with an animal protein factor, B_{12} supplement, gave better gains than the control ration (all-plant diet supplemented by 7 percent meat scraps and 5 percent dried whey); (3) satisfactory growth of pullets for egg production and for 5 to 6 pound roasters was obtained from the all-plant ration when the birds were on the old built-up litter. (Experiment Station Record)

LASSEN, SVEN, E. K. BACON, and H. J. DUNN. (Van Camp Sea Food Co., Inc., Terminal Island, Calif.)
AN EVALUATION OF CONDENSED WHALE SOLUBLES AS A SUPPLEMENT IN POULTRY NUTRITION. *Poultry Sci. 30:* 422-425. 1951.—This paper points out the differences between condensed whale solubles and condensed fish solubles. Analytical work, and 8-week chick growth expts. on both types of solubles show that condensed whale solubles contain a high percentage of high quality protein; further, it is a good source of the animal protein factor but is considerably inferior to condensed fish solubles as a source of the B-complex vitamins. Under the conditions of these growth expts. (0.2% cystine added to all rations)

it was shown that whale solubles could replace soy bean protein in a ration up to a level of 14% (7% protein), and up to a level of 20% if 0.1% additional tryptophan were added without any significant change in the growth of the chicks. At a level of 3%, condensed sardine solubles gave significantly better chick growth than did either of the commercial APF concentrates at the levels recommended by their manufacturers. In the same growth expts. condensed whale solubles at a level of 3% produced growth slightly, but not significantly, higher than commercial APF concentrates.—*Authors.* (Biological Abstracts)

LEWIS, E. W., C. A. ELVEHJEM, and E. B. HART. (U. Wisconsin, Madison.)
STUDIES ON THE NATURE OF THE NUTRITIONAL DEFICIENCIES OF WHEAT GLUTEN MEAL. *Jour. Nutrition 43:* 113-130. 1951.—Wheat gluten meal was studied as a source of protein for the chick in a purified diet which contained 10% gelatin and 0.3% L-cystine as additional sources of amino acids. The ability of the chick to utilize the amino acids in wheat gluten could be correlated to a fair degree with its essential amino acid content. A slight imbalance of essential amino acids could be corrected and optimum growth induced with small amts. of supplemental amino acids (lysine, threonine and tryptophan). The very young chick (under 200 g.) has a higher growth requirement for methionine in relation to the other essential amino acids than does the older chick.—*Auth.* (courtesy Wistar Bibl. Serv.).

McGINNIS, J. (State Coll., Washington, Pullman.)
WHAT'S NEW IN POULTRY NUTRITION. *(Feedstuffs [Minneapolis] 23:* 40. 1951.—Evidence is accumulating that fish meal, liver L fraction, or dried whey produce greater growth response with chicks or poults in the presence of antibiotics than is the case when antibiotics are not added; and conversely, that antibiotics produce a greater response when added to rations containing these animal protein sources than when added to an all-vegetable type ration. At least one additional unidentified factor, present in fish meal, fish solubles, certain liver fractions and dried whey, is required for maximum growth of chicks and turkey poults. It also appears that at least one additional unknown factor is required for hatchability of fertile eggs.—*H. L. Wilcke.* (Biological Abstracts)

McGINNIS, JAMES, L. R. BERG, JOEL R. STERN, and J. S. CARVER. (Washington State Coll., Pullman.)
EVIDENCE FOR AN UNIDENTIFIED GROWTH FACTOR FOR CHICKS AND TURKEYS IN PRODUCTS OF ANIMAL ORIGIN. *Fed. Proc. 10:* 387-388. 1951.—*An abstract.* (Biological Abstracts)

MACHLIN, L. J., C. A. DENTON, and H. R. BIRD. (U.S. Dept. Agric., Beltsville, Md.)
EFFECT OF VITAMIN B_{12} AND FOLIC ACID ON GLYCINE TOXICITY IN THE CHICK. *Fed. Proc. 10:* 388. 1951.—*An abstract.* (Biological Abstracts)

MADSEN, I. L.
POULTRY NUTRITION RESEARCH. *Colorado Farm & Home Research 1:* 4, Jan.-Feb. 1951. (Experiment Station Record)

MARCH, B., J. BIELY, and J. TONZETICH.
SUPPLEMENTATION OF WHEAT WITH AMINO ACIDS IN THE DIET OF THE CHICK. *Jour. Nutrition 42:* 565, December 11, 1950.—It has been demonstrated repeatedly that since lysine is the primary limiting amino acid in wheat protein, supplementation of wheat with lysine increases the nutritive value of this grain for various animals. For this reason emphasis has been placed on the effects of lysine additions to an all-wheat chick diet.

The addition of lysine to an all-wheat ration increased the growth rate of chicks and improved the efficiency of feed utilization.

Lysine in excess of the optimum level for the particular amino acid

composition of the ration decreased both the growth rate and the efficiency of feed utilization.

The addition of methionine or tryptophan to an all-wheat ration depressed the efficiency of feed utilization.

When wheat samples of different protein content were fed in rations containing no additional protein concentrates, growth rate and feed efficiency were slightly better with wheat of high protein content. (Experiment Station Record)

MATTERSON, L. D., and E. P. SINGSEN, LOIS DECKER, and ANNA KOZEFF. (Storrs Agric. Expt. Sta., Conn.)

A COMPARISON OF SEVERAL ANTIBIOTICS AS GROWTH STIMULANTS IN PRACTICAL CHICK-STARTING RATIONS. *Storrs Agric. Expt. Sta. Bull. 275:* 1-20. 1951.—Aureomycin, streptomycin, penicillin, terramycin, and bacitracin were added to an all-plant-protein ration and an all-plant-protein ration in which 2.5% fish meal replaced a like amt. of high protein soybean oil meal. Streptomycin was the least effective in promoting growth response in chicks. The greatest percentage growth response was obtained on the poorer-quality rations (all-plant protein). The greatest weight was obtained on the better-quality rations (all-plant protein plus fish meal) supplemented with antibiotics. When the ration contains fish meal, penicillin and bacitracin appear to act differently from the other antibiotics in that they maintain an increased percentage-growth response over the unsupplemented basal for a longer period of time. The data as a whole suggest that the better the quality of the ration with respect to protein and vitamins, the less the growth response obtained by supplementing the ration with antibiotics. No effort was made to determine the least quantity of antibiotic necessary to obtain a given response nor was any effort made to determine the stability of the antibiotics under practical feed-manufacturing conditions. The quantities of antibiotics used approximate 9 g./ton of feed and interpretations were made on this basis.—*Auth. summ.* (Biological Abstracts)

MILLIGAN, J. L., L. J. MACHLIN, H. R. BIRD, and B. W. HEYWANG. (U.S. Dept. Agric, Beltsville, Md.)

LYSINE AND METHIONINE REQUIREMENT OF CHICKS FED PRACTICAL DIETS. *Poultry Sci. 30:* 578, 586. 1951.—White Leghorn and R. I. Red chicks whose diet included cottonseed meal as the only protein supplement and a source of vitamin B_{12} required a total of 1% of L-lysine during their first 6 weeks for best growth. To reach this level, 0.8% of synthetic DL-lysine monohydrochloride was added to the diet. The methionine requirement of R. I. Red chicks fed soybean meal as the only protein supplement was no higher than 0.42% to 6 weeks of age. They required a combined total of only 0.7% of methionine and cystine. To reach these levels 0.1% of synthetic DL-methionine was added to the diet. The growth produced on the diet containing cottonseed meal supplemented with lysine did not equal growth obtained on the basal diet containing soybean meal. Studies on the effect of the maternal diet on the eggs and the chicks were conducted. A maternal diet relatively low in lysine did not affect the requirement of White Leghorn chicks for that amino acid. A maternal diet of low protein content in which corn and dehydrated alfalfa meal served as the only sources of protein did not affect the growth of R. I. Red chicks to 6 weeks of age or their requirement for methionine or lysine. The wts. of eggs and of chicks were reduced, but the percentages of lysine and of methionine in albumen and yolk were normal. Chicks produced from these eggs developed 4 times as much white barring as normal chicks did when they were placed on a lysine-deficient diet.—*J. L. Milligan.* (Biological Abstracts)

NIKOLAICZUK, NIKOLAI.

THE AVAILABILITY AND RETENTION OF PHOSPHORUS FROM ORGANIC AND INORGANIC SOURCES BY THE CHICK. *Ohio State Absts. Univ. Doctoral Diss. 59:* 187-192. 1948-40. 1950. (Biological Abstracts)

NIKOLAICZUK, N. (Macdonald Coll., Que., Canada.)
FEEDING STANDARDS FOR POULTRY. *Canadian Jour. Comp. Med. and Vet. Sci. 15:* 89-93. 1951.—Veterinarians encounter nutritional deficiencies in poultry more frequently than in other spp. of farm animals. These deficiencies are most prevalent soon after hatching as the nutrient reserve is low at best and growth is very rapid. Rations are discussed from the viewpoint of energy production, protein, minerals and vitamins. Factors which are likely to cause inadequate nutrient allowances, apart from deficient rations, are the source of the chicks, excessive dilution of the mash and management.—*R. Gwatkin.* (Biological Abstracts)

NILSON, HUGO W. (U.S. Fish. and Wildlife Serv., College Park, Md.)
FEEDING VALUE OF FISH MEALS. *Commercial Fish. Rev. 12:* 8-11. 1950.—The high protein and low fiber content make fish meals a valuable ingredient of "high-energy" rations for poultry and swine. Included in rations for breeding animals, fish meals balance the low-cost cereal or cereal by-products. The high protein content, and content of certain essential vitamins and minerals ensures rapid growth, greater production, and economical use of rations.—*J. L. McHugh.* (Biological Abstracts)

NILSON, HUGO W., and JOHN H. WAGNER. (U.S. Fish and Wildlife Serv. College Park, Md.)
FEEDING TESTS WITH SOME ALGIN PRODUCTS. *Proc. Soc. Exptl. Biol. and Med. 76:* 630-635. 1951.—Sodium alginates, Dariloid and Kelgin (The Kelco Company, San Diego, Calif.) were fed at levels at 5 to 30% in diets to rats for 10-week or lifetime periods. Propylene glycol alginate, Kelcoloid, was fed at levels of 5 to 25% in diets for varying periods to rats, mice, chicks, guinea pigs and cats. The difficulties experienced with feeding higher levels seem to be due, at least in greater part, to the physical texture imparted to the diets fed. Data on food and water consumption, longevity and necropsy studies indicate that these algin products are wholesome when fed at levels at least 10 times higher than when used in foods or pharmaceutical products.—*H. W. Nilson.* (Biological Abstracts)

PATTON, A. R.
METHIONINE IN BROILER MASH. *Down To Earth 7:* 6, Winter 1951. (Copyright 1951 by The Dow Chemical Co.)—In summary, extensive broiler feeding tests indicate that the addition of methionine to broiler mashes at levels of one-half to one pound per ton improves feed performance sufficiently to pay an increased profit to the user. The requirement for this low level of methionine cannot be replaced by APF, antibiotics, vitamin B_{12}, choline, or any other presently known feed supplement. In fact, the response to methionine seems to be enhanced by their presence. Conversely, there is no evidence that added methionine can supplant any other constituent in the feed. It is suggested that added methionine is good insurance against variability in nutritive value of soybean oil meal proteins. The over-all picture is favorable to the commercial use of added methionine in broiler mash. (Experiment Station Record)

PATRICK, H. (U. Tennessee, Knoxville.)
VITAMIN B_{12} AND ANTIBIOTICS IN TURKEY POULT NUTRITION. *Poultry Sci. 30:* 549-551. 1951.—Vitamin B_{12} failed to supplement an all-vegetable protein ration for poults. Fish meal and fish solubles supplied growth promoting nutrients that apparently were deficient in the all-vegetable protein ration. Meat scraps failed to supplement a poult ration as well as fish meal. Antibiotic feeding can result in growth stimulation; however, the degree of stimulation cannot be accurately predicted.—*Author.* (Biological Abstracts)

PETERSON, D. W.
EFFECT OF STEROLS ON THE GROWTH OF CHICKS FED HIGH ALFALFA DIETS OR A DIET CONTAINING QUILLAJA

SAPONIN. *Jour. Nutrition 42:* 597, December 11, 1950.—Addition of both cholesterol and cottonseed oil to a diet containing 20% alfalfa meal completely prevented the growth depression otherwise produced in chicks on such a diet. An identical effect was obtained with cottonseed oil and a phytosterol mixture prepared from soybeans.

The growth depression produced by *Quillaja* saponin in the chick diet was also prevented by the addition of a mixture of cottonseed oil and cholesterol to the diet.

Raising the chicks' blood level of cholesterol by treatment with diethylstilbestrol was ineffective as a means of preventing the growth depression brought about by a high level of alfalfa meal in the diet. (Experiment Station Record)

RIGDON, R. H., J. C. RUDE, and J. G. BIERI.

EFFECT OF HYPERVITAMINOSIS A AND HYPOVITAMINOSIS A ON THE SKELETON OF A DUCK. *A. M. A. Archives of Pathology 52:* 299, October 1951.—Birds failed to gain normally when fed a ration deficient in vitamin A and also when fed a standard ration supplemented with a large amount of vitamin A. Ducks fed the latter ration showed a diminution in the amount of pigment within the skin of their feet and legs. A decrease was found in the amount of carotene in the serum of ducks fed 100,000 units of vitamin A when they were compared with those fed 25,000 units of vitamin A. No significant pathologic or roentgenographic changes were observed in the bones of the extremities of the ducks fed either the vitamin-A-deficient rations supplemented with vitamin A or the standard ration supplemented with large amounts of vitamin A. From these experimental studies it is concluded that the effects of hypovitaminosis and hypervitaminosis A in the duck are different from those which have been described by others in the rat, the guinea pig and the dog. (Experiment Station Record)

REISER, RAYMOND. (Texas A. and M. Coll. System, College Station.)

THE BIOCHEMICAL CONVERSIONS OF CONJUGATED DIENOIC AND TRIENOIC FATTY ACIDS. *Arch. Biochem. and Biophys. 32:* 113-120. 1951.—Conjugated linoleic acid ingested by the hen makes its appearance in the egg. In subsequent eggs, the acids undergo spectrophotometric changes similar to in vitro oxidation, the max. of 233 mμ gradually disappearing and a broad absorption band in the region of 270 mμ making its appearance. The changes are more pronounced in the phospholipid acids of the eggs than in the neutral fat acids. alpha-Eleostearic acid ingested by the laying hen appears in the neutral fat of subsequent eggs along with large quantities of a newly synthesized dienoic acid. That the metabolic activity of the phospholipids is greater than that of the neutral fat is evidenced by the observation that typical absorption curves of eleostearic acids are not as prominent in the phospholipids as in the neutral fat, but larger amts. of the new dienoic acids are present.—*Raymond Reiser.* (Biological Abstracts)

ROSENBERG, M. M., and A. L. PALAFOX. (U. Hawaii, Honolulu.)

THE EFFECT OF CREEPING INDIGO (INDIGOFERA ENDECAPHYLLA) ON LAYING CHICKENS. *World's Poultry Sci. Jour. 7:* 9-15. 1951.—Creeping indigo leaf meal depressed egg production, body wt., and feed consumption of laying birds when fed in quantities of 1.25 to 5%. The effect varied in accordance with the concn. Egg production was reduced to zero within 8 weeks in the group fed a ration containing 5% creeping indigo leaf meal. Pullets raised on a diet containing 5% creeping indigo meal were not as sensitive to the toxic principle in the meal and did not cease production within 11 weeks, at which time this phase of the study was terminated. Their production was also significantly poorer than that of the controls. Hatchability was not reduced in this study when concns. of 1.25 and 2.5% creeping indigo leaf meal were fed. 5% creeping indigo meal significantly reduced hatchability. It is suggested that the toxic principle contained in the strain of *I. endecaphylla* tested in this study can be transmitted through the hatching egg. Chicks from dams fed creeping indigo leaf meal did not grow as

rapidly or survive as well to 14 days of age as did chicks from hens fed the control diet. The effect on the chick was influenced by the concn. of creeping indigo leaf meal fed to the dams.—*M. M. Rosenberg.* (Biological Abstracts)

RUSSELL, WALTER C., M. WIGHT TAYLOR, and WILLIAM A. PRICE, JR. (Rutgers U., State U. New Jersey, New Brunswick.)
RETENTION OF ESSENTIAL AMINO ACIDS BY GROWING CHICKEN. *Fed. Proc. 10:* 392-393. 1951.—*An abstract.* (Biological Abstracts)

SCOTT, M. L. (Cornell U., Ithaca, N.Y.)
THE GRASS JUICE FACTOR IN TURKEY NUTRITION. *Poultry Sci. 30:* 293-297. 1951.—The young poult definitely needs an unknown factor present in yeast, distiller's solubles, skim milk and grass and alfalfa juices, but destroyed during prolonged storage and during heat treatment. The possible relationship of the unknown factor to strepogenin to factor S and to the "grass juice factor" is discussed.—*M. L. Scott.* (Biological Abstracts)

SKINNER, J. L., J. H. QUISENBERRY, and J. R. COUCH. (Texas A. and M. Coll. System, College Station.)
HIGH EFFICIENCY AND APF CONCENTRATES IN THE RATION OF THE LAYING FOWL. *Poultry Sci. 30:* 319-324. 1951.—High efficiency rations proved entirely satisfactory for breeding birds. The performance of birds on the properly supplemented high efficiency rations was superior to that of the birds on the control ration in production, feed efficiency and gain in wts. and was equal or better than that of the birds on the control ration with regard to hatchability and livability of chicks hatched. The all-vegetable protein ration used in this expt., when properly supplemented with a source of vit. B_{12}, supported very satisfactory hatchability and egg production. The efficiency of feed utilization was improved in every case where an APF concentrate was included in the ration. Added choline does not appear to be a beneficial constituent of the high efficiency breeder ration. Egg wt. of the all-plant protein group, where no APF concentrate was added, remained below the avg. of the other groups.—*Authors.* (Biological Abstracts)

SLINGER, S. J., K. M. GARTLEY, W. F. PEPPER, and D. C. HILL. (Ontario Agric. Coll., Guelph, Canada.)
THE INFLUENCE OF ANIMAL PROTEIN FACTOR SUPPLEMENTS AND ANTIBIOTICS ON THE INCIDENCE AND SEVERITY OF WHITE FEATHERS IN TURKEYS. *Jour. Nutrition 43:* 345-355. Illus. 1951.—The addition of an animal protein factor (APF) supplement to a poult starting mash containing 29% protein and deficient in lysine (0.9%) increased the severity of the white feather condition previously reported as being due to a deficiency of this amino acid. When the diet contained 29% protein and 1.8% lysine, no cases of white feathers appeared as a result of including the APF supplement. Supplementing a diet containing 28% protein and 1.9% lysine with penicillin, aureomycin or APF resulted in much greater response in growth and feed efficiency than when such additions were made to a diet containing 20% protein and 1.2% lysine. Furthermore, the addition of these materials to the latter diet produced a high incidence of white feathers, while when added to the former diet no white feathers were noted. These results indicate that certain APF concentrates and antibiotics increase the lysine requirement of the poult for normal feather pigmentation. It is also suggested that these materials may increase the requirement of this species for other amino acids.—*Auth.* (courtesy Wistar Bibl. Serv.).

SWENSON, M. J. (Iowa State Coll., Ames.)
EFFECT OF A VITAMIN B_{12} CONCENTRATE AND LIVER MEAL ON THE HEMATOLOGY OF CHICKS FED ON ALL-PLANT PROTEIN RATION. *Amer. Jour. Vet. Res. 12:* 147-151. 1951. (Biological Abstracts)

Van REEN, ROBERT, M. WIGHT TAYLOR, and WALTER C. RUSSELL. (Rutgers U., New Brunswick, N.J.)
THE VITAMIN A REQUIREMENT OF THE TURKEY POULT FED A PURIFIED DIET. *Jour. Nutrition 43:* 235-244. 1951.—When Jersey Buff turkey poults were fed a purified diet containing graded levels of vit. A, 300 I.U./100 g. gave nearly as good growth as 500 I.U. or 600 I.U., but a level of 500 I.U. was necessary to prevent gross external and internal signs of A-avitaminosis. It is recognized that higher levels of vit. A may be necessary for the prevention of microscopic signs of deficiency.—*Auth.* (courtesy Wistar Bibl. Serv.).

WHITE, PHILIP L., D. MARK HEGSTED, and J. MAYER. (Harvard Sch. Publ. Health, Boston.)
INFLUENCE OF PROTEIN AND CHOLINE ON COPPER ABSORPTION [IN COCKERELS]. *Fed. Proc. 10:* 398. 1951.—*An abstract.* (Biological Abstracts)

AMINO ACID UTILIZATION IN CHICKS. *Colorado's 63rd Annual Report, 1949-50,* July 1, 1950, p. 37.—The mutual sparing effect of vitamin B_{12} and the methyl donors, choline and betaine, have been demonstrated in growing chicks. In the presence of ample vitamin B_{12}, the requirement for methyl donor is lessened. Choline, a synthetic product, is generally used as a methyl donor but betaine, derived from beet sugar molasss and Steffens filtrate, has been shown to be equally effective in practical chick rations. (Experiment Station Record)

EFFECT OF ALFALFA ON CHICK GROWTH. *Colorado's 63rd Annual Report, 1949-50,* July 1, 1950, p. 39.—Growth-depressing meals were more common in third-cutting alfalfa. Inhibitory samples were found in sun-cured as well as dehydrated meals. No evidence has been found yet to incriminate weed contamination, 2,4-D spraying, or other production factors. Granular grinding was superior to grinding very fine. The inhibitory factor is soluble in water, and ethanol is insoluble in acetone and is relatively stable to moist heat. The effect is not due to fiber. (Experiment Station Record)

NEW B VITAMIN FAMILY DISCOVERED, ONE ISOLATED. *Science News Letter 60:* 168, September 15, 1951.—The new vitamin group is called the lipoic acid family and the first isolated vitamin is called alpha lipoic acid. These vitamins are said to be a key factor in the utilization of sugars and starches and are found throughout nature. (Experiment Station Record)

NUTRITIVE VALUE OF FISH MEAL AND CONDENSED FISH SOLUBLES. *Feedstuffs 23:* 42, September 15, 1951. (Experiment Station Record)

PIGMENT FACTOR FOR BROILERS. *Feedstuffs 23:* 10, September 1, 1951.—Whitmoyer Laboratories, Inc., has announced a new product, "San Throl," a cod liver oil with xanthophyll and vitamin E added. The product was developed to provide the desired pigmentation by including the proper amount of xanthophyll in the broiler ration, the firm states. Xanthophyll is the crystalline compound present in yellow corn, green grass and alfalfa, which largely accounts for the yellow coloring.
When used at the recommended amount of 3½ lb. a ton of broiler ration, the product will furnish the required amounts of vitamins A and D plus pigmentation compound and vitamin E, the manufacturer states. (Experiment Station Record)

PRE-CURSOR OF B_{12} VITAMIN DISCOVERED. *Science News Letter 60:* 168, September 15, 1951.—An organism not yet completely identified was found in the stomach of cows and it produced a mixture of cobalt-containing pigments, two of which were isolated in crystalline

form. These two forms of what is called pseudovitamin B_{12} do not in themselves produce the spurt in chick growth that true vitamin B_{12} does, but they are used in the alimentary tract of cud-chewing animals to manufacture the B_{12} vitamin which cows and other such animals provide for themselves. (Experiment Station Record)

TESTS DEMONSTRATE NUTRITIONAL VALUE OF METHIONINE FOR POULTRY. *Agricultural News Letter 19:* 81, September-October, 1951. (Experiment Station Record)

UTILIZATION OF CAROTENE IN THE ANIMAL BODY. *Colorado's 63rd Annual Report, 1949-50,* July 1, 1950, p. 37.—Two experiments with chicks have substantiated previous work with hens showing that the carotene in alfalfa meal is more effective as a source of vitamin A activity than pure carotene or vitamin A itself. The presence of a carotene utilization factor has been strongly indicated. This factor is insoluble in water, is soluble in hexane or acetone, is in the saponifiable fraction, and is resistant to moist heat. An antioxidant in commercial use did not interfere with carotene utilization. Neither a dispersing agent or vitamin E influenced carotene utilization. (Experiment Station Record)

VITAMIN A, PROTEIN NEEDS OF TURKEY POULTS KNOWN. *Feedstuffs 23:* 50, September 15, 1951. (Experiment Station Record)

VITAMIN B_{12}. *Tennessee's Sixty-Second Annual Report,* 1949, p. 130.—Growth of poults through the first six weeks of brooding was the same when fed an all vegetable protein ration, abundantly fortified with B_{12}, or fed a ration essentially free of this vitamin. It appears that vitamin B_{12} is not required in the diet for growth in poults. (Experiment Station Record)

PATHOLOGY

ALMQUIST, H. J., and C. JOHNSON.

ANTIBIOTICS AND HEXAMITIASIS IN TURKEYS. *Proc. Soc. Exp. Biol. Med. 76:* 522, March 1951.—The results of this work, although preliminary in nature, strongly suggest that it may be possible to control hexamitiasis in turkeys by certain drugs or antibiotics. Four such drugs appeared beneficial, while one was not. (Experiment Station Record)

ATKINSON, J. M.

PULLORUM TOLERANCE; TWELFTH ANNUAL SURVEY. *Hatchery & Feed 25:* 48, November 1951. (Experiment Station Record)

BEARD, W. A.

LEUKOSIS: TYPES OF LEUKOSIS. *North Am. Vet. 32:* 697, October 1951.

1. The neural or nerve type.
2. The ocular type or so-called "gray-eye."
3. The visceral type is commonly known as "big liver disease" and is quite common.
4. Osteopetrosis is frequently called "big leg" by the farmer.
5. The tumor types we group together under one heading although there are many different types of cell formations. (Experiment Station Record)

BEARD, W. A.

FOWL CHOLERA. *North Am. Vet. 32:* 552, August 1951.—At times you will be justified in recommending immediate disposal of the entire flock. Suppose your hens are around 15 months old—if so, they

are practically "laid out" and even if no trouble had befallen them, they would be going into a moult very shortly.

On the other hand, suppose you have a flock of pullets just coming into production. Treatment is to be recommended in such a case. Isolation is of no value because all have been exposed. Your best results will be obtained with sulfonamides. Use the one of your choice. (Experiment Station Record)

BLATTNER, R. J., and A. P. WILLIAMSON.

DEVELOPMENTAL ABNORMALITIES IN THE CHICK EMBRYO FOLLOWING INFECTION WITH NEWCASTLE DISEASE VIRUS. *Proc. Soc. Exp. Biol. Med. 77:* 619, August 1951.—The lens and auditory sac showed defective development or were completely missing in 42% of 150 chick embryos infected with Newcastle disease virus at 45 hours of incubation. In 150 control embryos, inoculated with normal allantoic fluid, no similar defects were found. (Experiment Station Record)

BRANDLEY, C. A.

POULTRY DISEASES AND PUBLIC HEALTH. *North Am. Vet. 32:* 553, August 1951.—"A substantial number of infectious and parasitic agents apparently may pass from active or passive residence in poultry to man," according to (Public Health Reports, May 25, 1951.) He mentions a few diseases that illustrate the nature of the host-parasite relationship and other facts, pointing toward means for the removal of such existing health hazards. Named and briefly commented on are *Salmonella typhimurium* and *Erysipelothrix rhusiopathiae,* in their disease-provoking roles. (Experiment Station Record)

BRUECK, J. W., and G. D. BUDDINGH.

PROPAGATION OF PATHOGENIC FUNGI IN THE YOLK SAC OF EMBRYONATED EGGS. *Proc. Soc. Exp. Biol. Med. 76:* 258, February 1951.—The yolk sac of the developing chick embryo has proved to be highly suitable for the propagation of the following pathogenic fungi: *Actinomyces bovis, Nocardia asteroides, Nocardia intracellularis, Sporotrichum Schenkii, Histoplasma capsulatum, Cryptococcus neoformans* and *Coccidioides immitis.* This method promises to be of great value for the experimental study of these mycotic infections. (Experiment Station Record)

HITCHNER, S. B.

WHAT YOU SHOULD TELL GROWERS ABOUT NEWCASTLE VACCINES. *Hatchery & Feed 25:* 10, October 1951.—The main idea in controlling Newcastle disease appears to be that of choosing the right vaccine for the job . . . and then administering it correctly. (Experiment Station Record)

JOHNSON E. P.

THE EFFECT OF 4-AMINOPTEROYLGLUTAMIC ACID (AMINOPTERIN), A FOLIC ACID ANTAGONIST ON EXPERIMENTALLY PRODUCED AVIAN LEUKOSIS. *Vet. Med. XLVI:* 312, August 1951.—Forty-five of the 91 treated birds made clinical recoveries that lasted from two to 20 months after the treatment was discontinued. Thirty-three did not respond to treatment and died of erythro-granuloblastic leukosis, while 11 later developed visceral lymphomatosis and died. (Experiment Station Record)

RAWLEY, J., and F. R. HUNTER

ACTION OF *BACILLUS CEREUS* TOXINS ON CHICKEN ERYTHROCYTES. *Proc. Soc. Exptl. Biol. & Med. 77:* 99, May 1951.—A preliminary survey of the action of bacterial toxins on cells indicated that the toxins of *Bacillus cereus* had little or no effect on the rate of respiration of chicken erythrocytes. These toxins did, however, have a marked effect on the osmotic behavior of dogfish and chicken erythrocytes. (Experiment Station Record)

SCHLESINGER, R. W.
PROPAGATION IN CHICK EMBRYOS OF DENGUE VIRUS, HAWAIIAN STRAIN.—II. FINDINGS IN INFECTED EGGS. *Proc. Soc. Exp. Biol. Med. 76:* 817, April 1951. (Experiment Station Record)

SMITH, W. M., JR.
SUPPURATIVE PROVENTRICULITIS IN CHICKENS. *Vet. Med. 66:* 507, December 1951. (Experiment Station Record)

STUDIES ON THE TREATMENT OF COCCIDIOSIS. *North Amer. Vet. 32:* 533, August, 1951.—There is little to choose between the therapeutic effect of 0.2 percent sulphamethazine sodium and 0.06 percent sulphaquinoxaline sodium in the treatment of acute cecal coccidiosis of chicks.

Sulphaquinoxaline sodium is much more palatable than sulphamethazine sodium and is thus to be preferred in the treatment of coccidiosis in turkeys and pheasants. (Experiment Station Record)

SULFA DRUG SHOWS PROMISE FOR PREVENTING, CURING FOWL TYPHOID. *North Carolina's Research & Farming 8:* 8, Spring 1950. 72nd. Annual Report.—Treatment with the sulfaquinoxaline-sulfone combination in medicated feed apparently gave some protection against the disease. (Experiment Station Record)

POULTRY PRODUCTS AND MARKETING

ABBOTT, J. C. and E. C. VOORHIES.
PETALUMA LIVE POULTRY AUCTION: POULTRY MARKETING EXPERIMENT STUDIED FOR AUCTION VOLUME, GRADING POLICY, PRICES, BUYERS, PRODUCER APPRAISAL. *California Agriculture 5:* 2, August 1951. (Experiment Station Record)

AIRAN, J. W., and G. D. KALYANKAR. (Rajaram Coll., Kolhapur, India.)
DISTRIBUTION OF NITROGEN IN THE GUINEA-FOWL EGG PROTEINS. *Indian Jour. Med. Res. 38:* 255-258. 1950.—The dried egg yolk contained 16.7% ether extractives. The dried egg white contained 1.208% cystine S, and 0.4108% methionine S, the corresponding figures for egg-yolk being, 1.010% and 0.492%. The egg white contained 20.0% arginine N, 12.36% histidine N, 5.5% lysine N, 1.98% cystine N. and 46.15% total N in the mono-amino fraction, the corresponding figures for the egg yolk being 7.9475; 3.4862; 10.6594; 2.77 and 50.4%.—*J. W. Airan.* (Biological Abstracts)

BINKLEY, C. H., and O. R. VASAK. (Western Region. Res. Lab., Albany, Calif.)
A FRIABLE MEAL PRODUCED FROM FEATHERS. *Amer. Egg and Poultry Rev. 12:* 68, 70, 72. 1951.—Feathers were treated in a dry rendering type cooker with saturated steam for 30 to 60 minutes at gage pressures of 40 to 60 p. s. i. (287°-307°F.) then dried and ground. The resulting product can be used as an organic fertilizer, a mixed fertilizer component, or in the preparation of a plaster retarder. It has potential use as a feed component and as a potein material in the manufacture of a fire control foam compound.—*H. G. Lindquist.* (Biological Abstracts)

BOUTHILET, ROBERT J. (U. California, Berkeley.)
CHICKEN FLAVOR: THE SOURCE OF THE MEAT FLAVOR COMPONENT. *Food Res. 16:* 201-204. 1951.—The meaty flavor in chicken meat is due to a compound associated with the meat fibers rather than the fat. It can be extracted from the fibers by steeping in water or by extraction of the meat after suitable denaturation of the

protein. When the properties of the water-soluble flavoring compound are compared with those of known chemical compounds, it appears that the flavor precursor has properties similar to glutathione. Samples of pure gluthathione have an odor similar to meat when dissolved in water and heated to 60°C. The taste is similar to meat when the acid is neutralized.—*R. J. Bouthilet.* (Biological Abstracts)

BRADFORD, H. W.
CO-OP BROILER TURKEYS YEAR ROUND BUSINESS. *News for Farmer Cooperatives 18:* 3, December 1951. (Experiment Station Record)

CRAY, R. E.
SOURCES AND DISTRIBUTION OF EGGS AND POULTRY IN CLEVELAND, OHIO. *Ohio's 69th Annual Report, Farm Science and Practice, Bul. 705,* June 1951, p. 73.—Over 40 percent of the independent retailers sold less than 30 dozen eggs per week; another 30 percent sold between 30 and 60 dozen per week; less than 8 percent of the independent retail stores sold more than 150 dozen eggs per week.

Over 80 percent of the independent retail stores kept the eggs under refrigeration. This practice was almost unheard of 15 years ago. More than 90 percent of the retailers reported no complaints from their customers on the quality of eggs. (Experiment Station Record)

CRAY, R. E., and P. C. CLAYTON.
ANALYSIS OF TIME AND MILEAGE INVOLVED IN PICKING UP EGGS BY CENTRAL ASSEMBLING PLANTS. *Ohio's 69th Annual Report, Farm Science and Practice, Bul. 705,* June 1951, p. 74.—The route in northern Ohio, where the poultry population is concentrated, averaged 124 miles in length or 46 farm stops, with an average volume of 160 cases of eggs picked up. The average total time spent per case was 3.5 minutes. The southern Ohio route averaged 174 miles, 60 farm stops for 128 cases of eggs. Average time per case was approximately 6 minutes. Number of miles driven per case was .88 on the northern route, 1.3 for the southern route. (Experiment Station Record)

CRAY, R. E., and P. C. CLAYTON.
AN ANALYSIS OF LABOR USAGE AND COST OF OPERATIONS OF CENTRAL EGG ASSEMBLING PLANTS. *Ohio's 69th Annual Report, Farm Science and Practice, Bul. 705,* June 1951, p. 73.—The average total plant operating costs for the year varied from 52.5 cents to 91.4 cents per case of eggs.

The plant with the largest yearly volume had the lowest operating cost per case, and the plant with the smallest yearly volume had the highest operating cost per case, but the physical facilities for handling eggs and the type of operations carried on also had some bearing on the operating costs. (Experiment Station Record)

CSONKA, FRANK A., and MERRIAM A. JONES. (Agric. Res. Admin., USDA, Washington, D.C.)
DIETARY AND GENETIC EFFECTS ON ELECTROPHORETIC PROPERTIES OF EGG WHITE PROTEINS. *Fed Proc. 10:* 176. 1951.—*An abstract.* (Biological Abstracts)

DAWSON, L. E., and J. A. DAVIDSON.
FARM PRACTICES AND EGG QUALITY: PART II. PRODUCTION PRACTICES AFFECTING DECLINE IN EGG QUALITY. *Michigan's Quarterly Bulletin 34:* 89, August 1951. (Experiment Station Record)

DAWSON, L. E., and J. A. DAVIDSON.
FARM PRACTICES AND EGG QUALITY: PART III. EGG-HOLDING CONDITIONS AS THEY AFFECT DECLINE IN QUALITY. *Michigan's Quarterly Bulletin 34:* 105, August 1951. (Experiment Station Record)

EVANS, ROBERT JOHN, HELEN A. BUTTS, and J. A. DAVIDSON. (Michigan State Coll., East Lansing.)

THE VITAMIN B_6 CONTENT OF FRESH AND STORED SHELL EGGS. *Poultry Sci. 30:* 515-519. 1951.—Eggs from ten White Leghorn hens kept in individual laying cages were assayed for vit. B_6 with the "pyridoxinless" mutant, No. 299, of *Neurospora sitophila.* Fresh eggs and eggs from each hen that were stored at 0°C. for 3, 6, and 12 months were used. Fresh shell eggs contained on the avg. 123.6 μg. of vit. B_6 per egg or 2.52 μg. per g., egg albumen 68.1 μg. per albumen (217 μg./g.), and egg yolk 54.6 μg. per yolk (3.08 μg./g.). The vit. B_6 content of the eggs decreased during cold storage. Approx. half of the vitamin B_6 was lost in 12 months.—*R. J. Evans.* (Biological Abstracts)

FLETCHER, D. A., and C. K. JOHNS. (Dept. Agric., Ottawa, Ontario, Canada.)

THREE YEARS EXPERIENCE IN GRADING FROZEN EGGS IN CANADA. *Poultry Sci. 30:* 445-448. 1951.—In 1947 chemical and bacteriological analyses were made on commercial frozen whole egg. More than 10% had a bacterial count of over 10 million and approx. 18% had a solids content of less than 25%. Since normal whole egg has approx. 26% solids, a bacterial count of 250,000, for frozen egg grade standards are advisable. During 3 yrs. bacterial counts have been reduced, by using pre-cooled eggs, rapid freezing of the melange, breaking stock immediately, and improvement in equipment and plant sanitation. A new technic similar to that employed by the British Ministry of Food was tested. A plug from the tempered container was drawn. From this plug the texture, emulsification and color can be judged. It was found that the bacterial counts from the plug were approx. twice as high as the sample taken by the electric drill method. The original Canadian Frozen Egg standards were rather lenient from the standpoint of bacterial counts. These have been reduced to 2,500,000 for Grade A. A count of 500,000 is considered to be practical. The minimum of solids for Grade A is 25.8%. During 1949 the Burri Slant technique (American Public Health Association, 1948) was introduced to check the bacterial counts on all samples analyzed and any sample which exceeded 500,000 was then directed to an official lab where the count was detd. by the official plate method.—*Authors.* (Biological Abstracts)

GWIN, J. M. (U. Maryland, College Park.)

THE WEIGHT AND QUALITY OF FRESHLY DRESSED POULTRY AS AFFECTED BY DRESSING—COOLING—HOLDING. *Amer. Egg and Poutry Rev. 12:* 38, 40. 1951.—Table I lists the approx. rate of water absorption during chilling and soaking of freshly dressed poultry. Poultry dressed at semi-scald temps., 128°F., absorb more moisture than those dressed around 140° or 160°F. if they are chilled by being immersed in ice water. Table 2 shows the change in weight when pre-cooled chickens were held in air-cooled refrigerator and in an ice packed display case.—*H. G. Lindquist.* (Biological Abstracts)

KAHLENBERG, O. J., M. M. LALLY, and J. M. GROMAN.

WHAT IS THE BEST WAY TO SAMPLE FROZEN EGGS. II. *U. S. Egg and Poultry Mag. 57:* 14-15, 25. Illus. 1951.—The following methods of sampling 30-lb. cans of frozen eggs: A-AOAC triangle, B-Two diagonals, C-Edge, D-Midway, E-Center, and averages of (1) C+D+E and (2) A+B+C+D+E were checked against a frozen control sample for solid content and bacterial count. The frozen control was obtained by taking a liquid sample from churn and holding under identical conditions as the 30 lb. cans. The solid content was consistently higher and the bacteria content was consistently lower for each of the sampling methods than for the frozen control. These conclusions hold true for frozen yolk, but bacterial content of this product is not reported. The authors conclude that the present procedure for drilling frozen eggs for shavings does not give a representative sample for analysis. —*G. W. Newell.* (Biological Abstracts)

KLINE, LEO, HELEN L. HANSON, T. T. SONODA, JOAN E. GEGG, R. E. FEENEY, and HANS LINEWEAVER. (Western Region Res. Lab., Albany, Calif.)

ROLE OF GLUCOSE IN THE STORAGE DETERIORATION OF WHOLE EGG POWDER. III. EFFECT OF GLUCOSE REMOVAL BEFORE DRYING ON ORGANOLEPTIC, BAKING, AND CHEMICAL CHANGES. *Food Technol. 5:* 323-331. 1951.—Removal of glucose from dried whole egg markedly stabilizes baking quality and flavor of the product. Browning is practically eliminated and the extent of various chemical changes is greatly reduced. In the normal glucose-containing whole-egg powders, loss in baking quality is associated chiefly with the occurrence of the glucose-protein reactions, while the glucose-cephalin reaction plays a major role in off-flavor development.—*Leo Kline.* (Biological Abstracts)

LARZELERE, H. E., and C. C. SHEPPARD. (Michigan State Coll., E. Lansing.)

METHODS OF MEASURING CHANGES IN EGG QUALITY IN TERMS OF PHYSICAL GRADE AND ECONOMIC VALUE. *Poultry Sci. 30:* 389-392. 951.—The discussion involves the consideration of the advantages and limitations of several methods of measuring changes in egg quality such as (1) difference in number of top grade eggs, (2) a measure in terms of the number of grade level declines, (3) a measure which provides an assigned digit (or weight) to each grade in accordance with avg. value relationships between grades, and (4) actual changes in economic value of particular shipments of eggs.—*H. E. Larzelere.* (Biological Abstracts)

ROSENBERG, M. M., and A. L. PALAFOX. (U. Hawaii, Honolulu 14.)

POULTRY MARKETING STUDIES. II. EFFECT OF CAPETTE PELLETS ON FRYERS AND ROASTERS. *Hawaii Agric. Expt. Sta. Prog. Notes 65.* 1-8. 1951.—Chemical caponization, by means of pellets containing diethylstilbestrol, decidedly increased growth rate and improved the dressed appearance of the carcass. In all comparisons the procedure of implantation of 7-week-old cockerels for 6 weeks was superior to that of treating 9-week-old cockerels for 4 weeks. The value of animal protein factor supplement in grower rations was not clearly detd. It was not consistent in growth promotion, although the groups fed APF utilized their feed more efficiently than did their respective controls. Market finish was not improved by APF. This study has not corroborated the claim that chemical caponization of growing cockerels tenderizes the flesh, and improves its flavor, juiciness, and texture. A panel of 5 men and 5 women was unable on 2 successive days to distinguish between treated and non-treated birds.—*M. M. Rosenberg.* (Biological Abstracts)

SAUTER, E. A., W. J. STADELMAN, VIVIAN HARNS, B. A. McLAREN. (State Coll. Washington, Pullman.)

METHODS FOR MEASURING YOLK INDEX. *Poultry Sci. 30:* 629-630. 1951.—Yolk indices measured by Sharp and Powell or Funk methods were compared. The prediction equation for converting indices as determined by the Funk method to Sharp and Powell indices was derived. This equation is $y=0.0358 + 0.745x$.—*W. J. Stadelman.* (Biological Abstracts)

STADELMAN, W. J., and LEO S. JENSEN. (State Coll. Washington, Pullman.)

A STUDY OF EGG QUALITY ON THE FARM. *Poultry Sci. 30:* 367-371. 1951.—An egg quality survey was made during spring, summer, and fall on 15 farms in the Spokane area. Albumen index and candled grade measurements were made on the day laid and after a 7-day holding period. The total % of eggs in grades AA and A were nearly the same for the 2 periods, but there was a considerable shift of quality from AA to A grade during the holding period. Approx. 30% loss in albumen index occurred during the week. Wide variations between farms corre-

sponded closely to the temp. of the holding rooms. The factor of greatest importance in maintaining candled grade was humidity of egg room, with temp. almost as important. Temp. was the main factor in maintaining interior quality as measured by albumen index. Humidity of the egg rooms had little if any effect on rate of loss of albumen index.—*L. S. Jensen.* (Biological Abstracts)

STADELMAN, W. J., C. M. McCARTAN, E. L. BAUM, and B. A. McLAREN.
(State College Washington, Pullman.)
GROWTH AND PROCESSING SHRINKAGE OF DIETHYLSTILBESTROL TREATED FRYERS. *Poultry Sci. 30:* 512-514. 1951.—A group of 112 chickens was divided into 2 lots at 6 weeks of age. The chickens in one lot were implanted with a 12 mg. pellet of diethylstilbestrol. The diethylstilbestrol implant resulted in a highly significant increase in gain during the 2 weeks following implanting. The greater wt. held until the frying of the chicken, when there was a highly significant greater loss from the treated fryers than from the non-implanted birds.—*W. J. Stadelman.* (Biological Abstracts)

WINTER, ALDEN R., BLANCHE BURKART, and CAROLYN WRINKLE.
(Ohio State U., Columbus.)
ANALYSES OF FROZEN EGG PRODUCTS. *Poultry Sci. 30:* 372-380. 1951.—Samples of commercial liquid and frozen whole egg from the same containers varied widely in standard plate bacterial count. Freezing and storage of liquid egg products at 0° to -20°F. resulted in an avg. destruction of 55% of the standard plate bacterial count in 12 days, 62% in 30 days, 87% in 60 days and 90% in 400 days. The ratio of direct plate count bacteria to standard plate count average 2.2:1. It was much higher in frozen than unfrozen samples. There was little relation between the standard plate and coliform bacterial counts in the same samples. The coliform count was found to be preferable to the *Escherichia coli* presumptive test at 0.001 g. level for assessing the quality of liquid and frozen egg products. The bacteria content, percent solids and color of commercial frozen egg products obtained at the point of use varied widely.—*Auth. summ.* (Biological Abstracts)

WINTER, A. R., C. R. WETTLING, B. BURKART, and G. L. SNYDER.
CLEANING SHELL EGGS. *Ohio's 69th Annual Report, Farm Science and Practice, Bul. 705,* June 1951, p. 72.—The use of cleaning solutions with temperatures much higher than the eggs resulted in a greater number of stuck yolks. The use of combination detergents and germicides was about as efficient for cleaning as the use of detergents alone and at the same time provided some sanitizing effect. (Experiment Station Record)

WINTER, A. R., and C. P. McFarland.
OIL PROTECTION OF SHELL EGGS. *Ohio's 69th Annual Report, Farm Science and Practice, Bul. 705,* June 1951, p. 72.—Only 10 percent of some 50 fungicidal and bactericidal agents tested were suitable for use in egg treating oil because of the lack of oil solubility and the presence of odor, taste or color. Cetamium (cetyl pyridinium bromide), Arquad 2C (dedodecyldimethyl ammonium chloride) and Isothan DL-1 (dialkyldimethyl ammonium bromide) gave promising results when used under laboratory conditions. (Experiment Station Record)

WINTERS, R., and L. WITT.
DETROIT EGG PRICES AND CANADIAN EGGS. *Michigan's Quarterly Bulletin 34:* 75, August 1951. (Experiment Station Record)

YOU CAN USE CHICKEN FOR THRIFTY MAIN DISH. *Science News Letter 60:* 120, August 25, 1951.—The Agriculture Department's home economists suggest chicken scrapple. It makes a thrifty main dish as well as a good one, they say, and give the following recipe:

Ingredients for 8 servings: 3½ cups chicken broth; 1 tablespoon all-purpose flour; 1 cup corn meal; ½ teaspoon salt or 1 teaspoon if

the broth has not been salted; ¼ teaspoon poultry seasoning; 2 cups ground or chopped cooked chicken.

To make: Heat half the broth in a double boiler. Blend flour, corn meal, salt, and poultry seasoning; mix with the remaining cold broth. Slowly stir the corn meal mixture into the hot broth. Cook, stirring until the mixture thickens. Cook for 30 minutes or longer. Stir in the chicken. Pour into a well-greased loaf pan. Cool quickly and refrigerate. When firm, cut in slices. Roll slices in flour and fry in a little hot fat until brown. Serve with chicken gravy. (Experiment Station Record)

MANAGEMENT

ASMUNDSON, V. S., F. H. KRATZER, and R. D. MOSES. (U. California, Davis.)

RELATION OF ALL-NIGHT LIGHT TO EGG QUALITY IN TURKEYS. *Poultry Sci. 30:* 546-548. 1951.—Bronze turkey hens which were started and kept on all-night bright (150 watt lamps) light laid about the same total number of eggs but a higher (5.09 ± 0.67) percentage of waste eggs than hens on a 14-hr.-day. Hens on dim (10-watt lamps) all-night light did not respond to the light. The addition of vitamins A, D, and riboflavin to a presumably adequate ration did not increase hatchability nor decrease the % of waste eggs.—*Authors.* (Biological Abstracts)

BAROTT, H. G., L. G. SCHOENLEBER, and L. E. CAMPBELL. (U.S. Dept. Agric., Beltsville, Md.)

THE EFFECT OF ULTRAVIOLET RADIATION ON EGG PRODUCTION OF HENS. *Poultry Sci. 30:* 409-416. 1951.—Five independent expts., each covering the period from Sept. to July, on the egg production of hens irradiated with bactericidal radiation (2587 Å) as compared with that of a control group with no radiation but treated the same in all other respects, showed an increase in egg production of the irradiated hens over the controls of an avg. of 15%.—*Authors.* (Biological Abstracts)

BRANN, V. H.

INTENSIVE HOUSING TO SAVE LABOUR AND LAND. *Agri. Gazette of New South Wales,* Vol. LXII, Part 8, p. 438, August 1, 1951. —The wider adoption of intensive houses for laying stock is a trend in New South Wales poultry farming during recent years. Its purpose is to avoid the unnecessary spreading of houses over a wide area, and to save labour in general management, feeding, and egg collection.

In the more popular districts for specialized poultry farming land values and rates have increased considerably, and these items are a big factor on the average farm both in capital outlay and cost of production.

Intensive houses properly managed with deep litter help to produce a maximum proportion of clean, unwashed eggs suitable for export and cold storage. Moreover, the effects of electric lights in houses for layers is more marked for birds confined during the autumn and winter in dry, weatherproof houses. (Experiment Station Record)

HALBROOK, E. R. (Montana State Coll., Bozeman.), **A. R. WINTER, and T. S. SUTTON.** (Ohio State U., Columbus.)

THE MICROFLORA OF POULTRY HOUSE LITTER AND DROPPINGS. *Poultry Sci. 30:* 381-388. 1951.—A study of the microflora of poultry house litter and droppings in connection with tests on the relationship of litter management to the vitamin B_{12} requirements of growing chicks, during the period Aug., 1949, Jan., 1950, showed: a definite trend for bacteria, molds and yeasts to increase in poultry house litter with age up to at least 8 weeks; built-up poultry

litter (over 1 yr. old) contained fewer yeasts, molds and coliforms than either weekly changed or unchanged litter (1-8 weeks of use) and fewer lactobacilli and enterococci than unchanged litter; unchanged litter contained 116 times more molds, 100 times more yeasts, 43 times more coliforms, and 11 times more lactobacilli than built-up litter; liming built-up litter at the rate of 10 to 15 lb./100 sq. ft. of floor space as needed for conditioning the litter reduced noticeably all classes of bacteria, yeasts, and molds; fresh droppings showed a slight tendency to follow the litter microflora by being lower from chicks on built-up litter, but the droppings of chicks on wire were as high on an average as those from chicks on litter, indicating that feed and water are major factors affecting the microflora of the intestinal tract of chickens; storage of droppings at 30 and 37°C. for 1 week caused a drop to zero in yeasts and a very marked drop in molds.—*E. R. Halbrook.*—Biological Abstracts)

HANSEN, P. L.

RATE OF LAY KEY TO PROFITS: "NET" BEGINS AT ABOUT 150 EGGS PER LAYER. *The Agricultural Situation 35:* 11, September 1951.—The chief reason is the large proportion of the total feed consumed by the hen that is used for maintenance. At the 150-egg level approximately 75 percent of the feed is needed for this purpose. Feed used for maintenance is quite constant; but it drops proportionately as the hen increases its feed to produce more eggs. We find it takes at least a hundred eggs just to pay for the feed for an average hen. Returns to poultry farmers are low until the average egg production exceeds 150 eggs per layer but increase rapidly after that point. (Experiment Station Record)

HILL, STANLEY R. (U. Brit. Columbia, Vancouver, Canada.)

A CONSIDERATION OF THE PROBLEMS INVOLVED IN VENTILATING THE POULTRY LAYING HOUSE. *Poultry Sci. 30:* 558-568. 1951.—The problem of poultry ventilation evolves primarily into the physiol. aspect of preventnig "heat stagnation" and the engineering aspect of removing excess moisture. The former involves, in part, the thermoregulatory responses of the domestic fowl to changes in the environmental temp. These responses are effective over a wider range of inadequate heat than of excessive heat. The latter frequently demands efficient utilization of the heat loss from the birds, a requisite considerably aggravated by the disproportionate ceiling height of the poultry house relative to the height actually required by the birds themselves. This situation emphasizes the importance of insulating all construction components of the house, including the floor, to conserve the heat supply for this purpose. In addition, insulation offers valuable protection against rapid temp. changes resulting from extreme weather fluctuations. The increasing acceptance of the cost involved in achieving proper ventilation serves as a reliable criterion of its economic value to the poultry industry.—*S. R. Hill.* (Biological Abstracts)

HOFFMAN, EDMUND, and JAMES M. GWIN.

SUCCESSFUL BROILER GROWING. *Watt Publishing Co.* 2nd ed. 256 p.: Mount Morris, Illinois, 1951. Pr. $3.50.—This edition has been completely rewritten and the marketing phases of broiler production developed by a new co-author Dr. Gwin. The book is written specifically for the broiler grower and its contents are arranged to cover: (1) The production phases of broiler growing, and (2) the marketing and economic phases. In the first phase there are 8 chapters dealing with historical development, producing areas, breeds, housing, feeding, brooding, and disease prevention. The remaining 6 chapters deal with marketing, home killing, financing, battery production, breeding, and hatching egg production. The authors, realizing that the commercial broiler industry is in a constant state of flux, have supplemented their text with a list of references in the appendix to further assist the grower in keeping currently informed of developments in their industry.—*N. G. P.* (Courtesy Poultry Science)

INSKO, W. M. JR., S. L. LOWRY, and L. M. CALDWELL. (U. Kentucky, Lexington.)
THE ALL-PULLET FLOCK VS. THE HEN FLOCK. *Kentucky Agric. Exptl. Sta. Bull. 560:* 1-4. 1951. (Biological Abstracts)

JEFFREY, F. P.
WHAT TO DO ABOUT "I.Q." *Hatchery & Feed 25:* 11, November 1951.—Here's some "straight dope" on what *you*, as a hatcheryman, can do to improve interior quality. Also, watch breeders with good I.Q. programs. (Experiment Station Record)

KENNARD, D. C., and V. D. CHAMBERLIN.
AN EXPERIMENT ON EGG PRODUCTION. *Ohio's 69th Annual Report, Farm Science and Practice, Bul. 705,* June 1951, p. 72.—Hens on pasture required 4.6 pounds of corn and minerals at a cost of 13 cents per dozen eggs as compared to 7 pounds of the complete feed mixture for those hens indoors at a cost of 25 cents per dozen eggs produced. From April until November, this saving in feed amounted to $1 per bird in feed costs. At this rate, the acre of Ladino, which will handle about 100 hens, is capable of yielding $100 per season in reduced feed costs for egg production. (Experiment Station Record)

LEVINE, P. B.
CORNELL OPPOSES USE OF BUILT-UP LITTER FOR STARTING BABY CHICKS. *Feedstuffs 23:* 36, October 13, 1951.—Distadvantages: One of the first difficulties was the occurrence of a very severe keratitis or inflammation of the cornea of the eye as a direct result of evolution of large quantities of ammonia gas from the built-up litter when it became damp.

In severe cases the blindness may be permanent.

Furthermore, large roundworms in relatively young chickens have become a problem in many flocks started on old litter.

Coccidiosis has been appearing in chicks reared on used litter at a much earlier age than heretofore has been experienced, and during the cold months of the year.

The natural processes which might be expected to destroy parasite eggs, coccidia and other disease-producing agents do not destroy them all with certainty. (Experiment Station Record)

MUELLER, C. D.
FOR BREEDERS . . . DOUBLE-DECKED PENS. *Hatchery & Feed 25:* 14, November 1951.—Novel trapnesting system saves time and labor in a new Kansas breeding house. No handling of hens is necessary. (Experiment Station Record)

PROMERSBERGER, W. J., and R. L. BRYANT.
FORCED AIR VENTILATING SYSTEMS FOR POULTRY HOUSES COMPARED TO THE MUSLIN FRONT AND SLOT SYSTEMS. *North Dakota's Bimonthly Bulletin 14:* 3, Sept.-Oct. 1951. (Experiment Station Record)

ROSENBERG, M. M., and RENE GUILLOU. (U. Hawaii, Honolulu 14.)
A SUN-PORCH DEVELOPER PEN DESIGNED FOR CHICKENS REARED IN HAWAII. *Bull. Hawaii Agric. Expt. Sta. 105:* 1-12. 1951.—A sun-porch developer pen was designed for areas of Hawaii that are not excessively wet. The constituent parts of this structure are discussed so that the basic principles may be applied to both existing developer pens and new construction. Diagrams and pictures are presented. The cost of building materials was approx. 40% less than that required to build conventional developer pens of equivalent floor area. The labor required to care for growing birds on a per-bird basis was reduced as the size of the sun porch was increased. Holding constant the number of sq. per bird, the 9-ft. sun porches required 13-22% and the 18-foot sun porches required 15-28% less labor than did the standard developer pen. Pullets and cockerels grew as well on sun porches as they did in standard developer pens. In 5 pens out of 6 they exceeded the

body wt. of their respective controls. There were no significant differences in feed consumption and mortality between the groups reared on sun porches and standard developer pens.—*M. M. Rosenberg.* (Biological Abstracts)

STRICKLER, P. E., and P. E. SMITH.
MOST CHICKS BROODED WITHOUT HENS . . . VARIOUS HEAT SOURCES USED. *The Agricultural Situation 35:* 13, August 1951.—Reports from crop correspondents in February 1950 indicate that 29 percent of the total chicks raised in 1949 were brooded with heat from electricity, 27 percent with oil, 21 percent with coal, 10 percent with gas, 6 percent with heat from wood and 7 percent with hens. (Experiment Station Record)

WARREN, D. C., RALPH CONRAD, A. E. SCHUMACHER, and T. B. AVERY. (Kansas Agric. Expt. Sta., Manhattan.)
EFFECTS OF FLUCTUATING ENVIRONMENT ON LAYING HENS. *Kansas Agric. Expt. Sta. Tech. Bull. 68:* 1-48. Illus. 1950.—Total annual egg production was not greatly improved by providing a uniform environmental temp. of 65° F. This temp. slightly depressed egg size during winter but permitted a constant increase in egg size during the entire 1st yr. of laying. High summer temps. depressed shell thickness but there was some seasonal decline in shell thickness even under a constant environmental temp. As the egg's size increased, the albumen component increased less rapidly than the yolk causing a decline in the proportion of albumen. Maintenance of laying birds under uniform temp. conditions delayed the onset of the annual fall molt and in some instances inhibited it. The growth of the comb seemed to be stimulated by artficial light and by the uniform environmental conditions provided.—*D. C. Warren.* (Biological Abstracts)

WINTER, A. R., E. R. HALBROOK, and B. BURKART and F. CORDS.
THE MICROBIOLOGY OF POULTRY HOUSE LITTER. *Ohio's 69th Annual Report, Farm Science and Practice, Bul. 705,* June 1951. p. 71.—During the first eight weeks of use there was an increase in the number of bacteria, yeasts and molds in litter. Later, as the alkalinity of the litter increased, from about pH 6.5 to 8, there was a decrease in the number of molds, yeasts and coliform, lactobacilli and enterocci bacteria. The addition of lime to litter reduced the number of bacteria, yeasts and molds and increased the pH .5 to 1.0 units. Nearly all the 142 bacteria, yeasts and molds isolated from poultry house litter produced some vitamin B_{12}. A strain of *Aerobacter aerogenes* was isolated from poultry litter which produced more vitamin B_{12} than produced by *Bacillus megatherium* and *Streptomyceus griseus.* The addition of 2.5 percent of autoclaved built-up litter to a vitamin B_{12} deficient chick ration produced better growth than 20 micrograms of vitamin B_{12} supplement per kilo of ration. (Experiment Station Record)

ALTITUDE INCUBATION. *Colorado's 63rd Annual Report, 1949-50,* July 1, 1950, p. 38.—The results of 10 incubation trials, involving about 8,000 chicken eggs, indicate that levels approximating 23.5 percent oxygen and 0.4 to 0.6 percent carbon dioxide are close to the practical optimum for maximum hatchability and quality of chicks at an altitude of 5,000 feet. The average increase in hatchability was about 10 percent of fertile eggs. (Experiment Station Record)

GENERAL

ALEXANDER, LUCY M., GRACE E. SCHOPMEYER, JESSIE C. LAMB, and STANLEY J. MARSDEN. (U.S. Dept. Agric., Washington, D. C.)
TURKEY TEMPERATURE AS THE END POINT IN ROASTING. *Poultry Sci. 30:* 520-524. 1951.—To evaluate the usefulness of

turkey temp. as a means of determining when the bird is properly done, temps. at different stages of doneness were taken in leg (thigh); breast (thickest portion), and stuffing during the roasting of 15 turkeys of different ages, vars. and sexes. Breast and stuffing temps. were similar in the same turkey but among satisfactorily cooked birds of different conformation or build, they ranged from 80 to 95°C. Leg temps. ranged from 90 to 94°C. Results do not justify recommending a specific end-point temp. for adequate cooking of a whole turkey.—*G. E. Schopmeyer.* (Biological Abstracts)

CHRISTENSEN, R. P., and R. L. MIGHELL.
COMPETITION BETWEEN REGIONS IN PRODUCING CHICKENS AND EGGS. *The Agricultural Situation 35:* 9, September 1951. (Experiment Station Record)

COOPER, JAMES B.
POULTRY FOR HOME AND MARKET. 487 p. Turner E. Smith and Co.; Atlanta, Georgia, 1951. Pr. $2.96.—The author writes more particularly for the student in vocational agriculture or in high school and for the veteran receiving farm home training. 4-H club members will also find the subject matter and method of presentation particularly helpful and well suited for their poultry projects. While the book designed primarily as a guide for the home flock owner, the writer's wide experience in the practical application of basic scientific knowledge to poultry husbandry makes the book a source of basic information, useful to the farmer and also the commercial poultryman. 32 chapters grouped into 9 units of related material comprise the subject matter. One of the chapters deals with commercial broiler production, others deal with turkey production, duck raising, squab production and upland game birds.—*E. S. S.* (courtesy Poultry Science) (Biological Abstracts)

HESS, C. W.
MEAT ROP TEST; REPORT OF THE FIRST NATIONAL POULTRY IMPROVEMENT PLAN MEAT PRODUCTION PERFORMANCE TEST. *Hatchery & Feed 25:* 36, November 1951. (Experiment Station Record)

ROSENBERG, MORTON M., and T. TANAKA. (U. Hawaii, Honolulu.)
PERFORMANCE OF IMPORTED STRAINS OF NEW HAMPSHIRES UNDER HAWAIIAN CONDITIONS. *Hawaii Agric. Expt. Sta. Bull. 104.* 1-18. 1951.—Four strains of New Hampshires, hatched within 3 days of each other, were reared and maintained under the same conditions to 17 months of age. Three of these strains were imported from the Mainland. Data were collected on rate of growth, economy of feed consumption, livability, perosis, defects and disqualifications, rate of feathering, age at sexual maturity, egg production, and certain internal egg characteristics. It was found that the four strains differed significantly in growth rate, adult body weight, livability to 12 weeks and hen-house mortality, incidence of perosis, rapid feathering, hen-house production, monthly hen-day production, and meat and blood spots. The local strain, maintained under Hawaiian conditions for several generations, was outstanding for livability during both the growing and adult stages as well as for freedom from perosis. The local strain produced about as well as the best imported strain and was definitely superior to the other two. Only in body size did the local strain compare unfavorably with the imported strains. To increase resistance to death and perosis, it was suggested that chickens be subjected to a systematic program of selection under Hawaiian conditions.—*M. M. Rosenberg.* (Biological Abstracts)

POULTRY FARMING. *Alaska Farms Organization and Practices in 1949.* Mimeograph Circular 1, March 1951, p. 50.—The 8 poultry farmers had an average gross income of $10,741. Eighty-two percent was cash income, of which half came from egg sales. Twenty-three percent of cash income came from potatoes and 18 percent from non-farm

work. The remainder came from several miscellaneous sources.

Total expense averaged $5,385 per farm. Eighty-nine percent of this was cash expense. The feed bill accounted for almost half of this, and hired labor accounted for a tenth.

Net income ranged from $3,590 to $8,230 on the 8 poultry farms, and averaged $5,356. The average was greater than for dairy and potato-vegetable farms but less than for potato farms. Non-farm work accounted for 30 percent of net income. (Experiment Station Record)

Note:

The Experiment Station Record, published by the Office of Experiment Stations, United States Department of Agriculture, was discontinued as a publication several years ago. References to "Experiment Station Record" in some of the items of this abstract material, therefore, refer not to the publication of this name but to the records kept by the Office of Experiment Stations.

MICROFILM SERVICE

The World's Poultry Science Association has entered into an agreement with University Microfilms, Ann Arbor, Michigan, U.S.A. to make available the World's Poultry Science Journal in microfilm form.

Microfilm makes it possible to produce and distribute copies of journals on the basis of the entire volume in a single roll, in editions of 30 or more, at a cost approximately equal to the cost of binding the same material in a conventional library binding.

Under the plan the library keeps the printed issues unbound for circulation. When the paper copies begin to wear out or are not called for frequently they are disposed of and the microfilm is substituted.

Sales are restricted to those subscribing to the paper edition and the film copy is only distributed at the end of the volume year.

The microfilm is in the form of positive microfilm and is furnished on metal reels, suitably labeled. Inquiries concerning purchase should be directed to University Microfilms, 313 N. First Street, Ann Arbor, Michigan, U.S.A.

WORLD'S POULTRY SCIENCE ASSOCIATION

Financial Statement

Jan. 1, 1951 to Dec. 31, 1951

	Dr. Heuser	Major Macdougall
Balance Jan. 1, 1951	$ 842.75	£1502- 4- 0
Receipts		
Membership	3,121.20	812- 8- 8
Advertising	2,187.87	227-15- 0
Subscriptions	246.71	4- 4- 9
Reprints	24.15	
Back Volumes	65.25	
Congress Reports	20.00	1-16- 6
Transfer from Savings Account	2,000.00	
Transfer from Major Macdougall (£1122- 9-10)	3,215.06	
TOTAL	$11,722.99	£2548- 8-11
Expenditures		
Printing Journal	$ 2,413.94	
Translations	42.00	5-14- 0
Postage	325.65	19-16- 1
Biological Abstracts	28.00	
Clerical Assistance	633.10	60- 0- 0
Supplies (letterheads, envelopes, stencils, etc.)	267.09	11- 3- 2
Reprints	23.69	
Subscriptions to Poultry Science	11.75	
Editor	400.00	
Expenses, President	1,172.18	
Expenses, Secretary to President	962.10	
Expenses, Treasurer	1,078.44	
Expenses, Secretary	—	42-14- 6
Congress Headquarters in Paris	214.02	
Miscellaneous	—	3- 1- 7
Transfer to Treasurer	—	1122- 9-10
Rebate to Branches	—	10-10- 0
TOTAL	$ 7,571.96	£1275- 9- 2
Balance Dec. 31, 1951	$ 4,151.03	1272-19- 9
Balance Savings Account, Dec. 31, 1951	$ 2,435.33	
Balance Dr. Fangauf's Account, Dec. 31, 1951 DM	1,452.13	

SUBSCRIPTIONS FOR 1952 NOW DUE

If you have not paid your subscription for this year, please read the leaflet enclosed with this issue and remit the same as directed. This will assure your receiving the World's Poultry Science Journal.

BRANCH ORGANIZATIONS OF THE WORLD'S POULTRY SCIENCE ASSOCIATION

United Kingdom Branch

Netherlands: Dr. R. Coles

Secretary-Treasurer: Major Ian Macdougall

Netherlands Branch

Chairman: Dr. L. de Blieck

Secretary: Ir. P. Ubbels

Swiss Branch

President: Dr. Hans Engler

Secretary-Treasurer: Harald Ebbell

OMITTED FROM MEMBERSHIP LIST IN OCTOBER-DECEMBER 1951 ISSUE

BELGIUM

J. Mullens, Bierstraat 46, Zolden.

ENGLAND

H. D. Barley, Gay Hill, near King's Norton, Birmingham.
Mrs. H. D. Barley, Gay Hill, nr. King's Norton, Birmingham.
S. A. Maycock, The Smallholder, Tower House, Southampton St., Strand, London, WC 2.
C. W. Raven, Broughton Hatchery, near Filkins, Lechlade, Gloucester.
John Scott, Midlands Accredited Stns., Hatchery Ltd., Broome, nr. Stourbridge.
Miss M. Strain, Brynore Hall, Dudleston Heath, Ellesmere, Shropshire.
L. C. R. Thom-Postlewaite, Armaside Lorton, Cockermouth, Cumberland.

FRANCE

Mrs. E. Flamencourt, Exploitation avicole du Petit-Aunay a Meung, S. et L. (Loiret)
G. Lissot, Laboratoire Avicole, 107 Rue Isambard, Pacy-sur-Eure, Eure.

GERMANY

H. Döpfer, Herkulesstrasse 8, Kassel.
Max Reschke, Peiner Geflügelhof, Peine.
Wilhelm Walther, Nordstrasse 5-7, Oldenburg i. Oldenburg.

HOLLAND

A. Jansen, 16 Kalkoenweg, Ermelo.
C. Romijn, Waterweg 32A, De Bilt.

POLAND

Laura Kaufman, Krola Leszczyniskiego 9, Lublin.

UNITED STATES OF AMERICA

J. A. Hannah, Box 190, East Lansing, Michigan.
D. R. Marble, R.D. 2, Warsaw, Indiana.
G. M. Peterson, 3011 Elmira Rd., Eugene, Oregon.

IN SECURING POULTRY DISEASE INSURANCE

WISHING WON'T DO . . .
VINELAND VACCINES WILL!

● Among poultry scientists, poultry raisers, hatcherymen, feedmen, wherever poultry products are used, the supremacy of VINELAND VACCINES as matchless insurance against poultry diseases is universally recognized. Gaining this consumer acceptance is the result of rigid scientific effort and farm-tested proof that where flocks have been immunized against specific diseases with VINELAND VACCINES, positive protection was invariably secured.

Yes, a chain of victories has been forged by VINELAND POULTRY LABORATORIES in its endless research and unrelenting battles against the ravages of Newcastle . . . Tracheitis . . . Fowl Pox . . . Pullorum and numerous other poultry profit destroyers. In the wake of each VINELAND conquest, thousands of poultrymen have been able to secure freedom from the risk of mortality.

VINELAND POULTRY LABORATORIES manufacture a complete line of poultry biologics, including Vineland Stained Antigens—K Formula, also K Polyvalent, Sulfaquinoxaline Mixes, Drugs and Disinfectants.

FREE Handbook on Poultry Disease Control with special attention to the prevention of Newcastle Disease, Tracheitis, Fowl Pox and Pullorum. Write today for your copy.

VINELAND POULTRY LABORATORIES

BOX 70 **VINELAND, N. J.**

ADDITIONS TO MEMBERSHIP LIST OF THE WORLD'S POULTRY SCIENCE ASSOCIATION

(Received since last issue)

AFFILIATIONS

HOLLAND

Nederlandse Pluimvee Federatie (N.P.F.), Velperweg 53, Arnhem.

SPAIN

Union Catalana de Avicultores y Cunicultores, Rambla de los Estudios, 8-2°, la Barcelona.

UNITED STATES OF AMERICA

Miller Manufacturing Co. Inc., 251 W. Kellogg Blvd., St. Paul 2, Minn.

MEMBERS

AUSTRALIA

V. H. Brann, Dept. of Agr., Farrer Place, Sydney, New South Wales.

CANADA

Miss Ella Onnen, % Pacific Hatchery, 570 King George Hway., R.R. 4, New Westminster, B.C.

A. E. Palmer, Supt., Dominion Exp. Station, Lethbridge, Alta.

CZECHOSLOVAKIA

Jan Jodhradsky, Brno, Zemedelska 3.

ENGLAND

M. Butchart, Kettles Farm, Mickfield, Stowmarket, Suffolk.

AGRICULTURAL COMPANY OF PAN AMERICA

GUILFORD, CONN., U.S.A.

World Shippers of Hatching Eggs, Chicks, Breeding Stock and Poultry Equipment of all kinds.

SHIPMENTS TO 45 COUNTRIES LAST YEAR

WE HANDLE

U.S. Pullorum Clean chicks, turkey poults, chicken, turkey and duck hatching eggs

Feeds

Vaccines

Poultry and Dairy Equipment

We Ship only the best U.S. products from leading breeders and manufacturers.
We Provide the most efficient service possible
We Give personal attention to each order
We Make it easy for world customers to buy in the United States
We Ship by air or ocean to any country in the world.

YOUR INQUIRIES ARE INVITED.

AGRICULTURAL COMPANY OF PAN AMERICA

GUILFORD, CONN., U.S.A.

R. Ellis, Manor Farm, Hart, West Hartlepool, Durham.
E. G. Morris, Min. of Agr., Animal Health Division, 45 Southgate St., Winchester, Hampshire.
J. A. Senior, Sowood Poultry Farm, Nafferton, Driffield, Yorks.
Charles Webley, "Dilwyn," Manor Rd., St. Albans, Herts.

GERMANY

Fr. Marga Dieckmann, Steenbeker Weg 151, Kiel-Wik.

HOLLAND

G. J. W. Beestman, Jasmijnstraat 28, Almelo.
N. van Vliet, % N. V. Philips-Roxane, Postbus 2, Weesp.

INDIA

C. M. Jasawalla, Fair Fields Farm, 14 Salisbury Park, Poona.

NORTHERN IRELAND

R. G. Calvert, The Poultry Farm, Ballywater, Co. Down.

PHILIPPINES

Julian Lou, 421 Azcarraga St., Manila.

SARAWAK

M. Edwards, Nono, Rubber Road, Kuching.

SOUTH AFRICA

J. W. Easterbrook, P.O. Pinetown, Natal.

SPAIN

Alfonso Montero, 12 de Octubre 8, Cordoba.

UNITED STATES OF AMERICA

Dent Holcomb, 317 N. Elm, Grand Island, Neb.
M. T. Swearengen, Henderson Produce Co., Monroe City, Mo.

"BASIC PRODUCERS" *of* NUTRITIONAL PRODUCTS *from the* SEA . . . .

"Basic Producers" of vitamin concentrates — not just blenders or mixers — that's the important thing to remember about Whitmoyer Laboratories, Inc.

Extensive, modern Whitmoyer marine products processing plants strategically located along the Atlantic Coast—in New England and in Nova Scotia—produce thousands of tons of meals and oils. From these basic raw materials—rich in natural vitamins and valuable marine proteins—are developed, through our own nutritional experiments and practical farm use, products which are scientifically sound and economically practical.

WHITCOD, our pure cod liver oil, fortified to any required potency, has long been recognized for its uniformly high quality and reliability.

*CLO-MEAL and FLAV-A-DEE, dry vitamin concentrates made from a cod liver meal base, have been used with outstanding results in hatchability and production.

TRA-MIN, the original patented trace mineral compound with its famous stabilized marine "protein-bound" iodine content has proven to be the ideal way to incorporate the essential trace elements with a single product.

For more complete information on these and other Whitmoyer products—including the Whitmoyer line of Poultry and Livestock Health Products—write us today.

*CLO-MEAL and FLAV-A-DEE, as well as other Whitmoyer vitamin concentrates, are natural sources of Vitamin B_{12}. When these products are used at our recommended levels, supplemental amounts of B_{12} are not required.

Whitmoyer LABORATORIES INC

Manufacturing Chemists

MYERSTOWN, PENNA., U.S.A.

Branch Plant

ROCKLAND, MAINE

In Canada

YARMOUTH, N.S.
WHITMOYER LABORATORIES, LTD.,

SULFAQUINOXALINE
Proved Most Effective Coccidiostat

CHICKEN COCCIDIA — PREVENTION

	SQ	DRUG A	DRUG B	DRUG C	DRUG D	DRUG E	DRUG F	DRUG G
E. Tenella	+	+	+	✓	✓	+	✓	✓
E. Necatrix	+	✓	+	○	○	+	✓	✓
E. Acervulina	+	✓	○	○	○	○	○	○
E. Maxima	+	○	○	○	○	○	○	○
E. Brunetti	✓	○	○	○	○	○	○	○

TURKEY COCCIDIA — PREVENTION

E. Meleagrimitis	+	○	○	○	○	✓	○	○
E. Meleagridis	+	○	○	○	○	○	○	○

+ HIGHLY EFFECTIVE ✓ SOME PROTECTION ○ INEFFECTIVE

The chart shows the greater effectiveness of SULFAQUINOXALINE compared with seven other drugs used to prevent coccidiosis outbreaks in chickens and turkeys. These data were obtained from published reports in scientific journals and from unpublished experiments covering both laboratory tests and field trials. Complete details available.

The data in the above chart—translated to practical field application—explain why Sulfaquinoxaline has given superior protection against coccidiosis outbreaks to millions upon millions of chickens and turkeys.

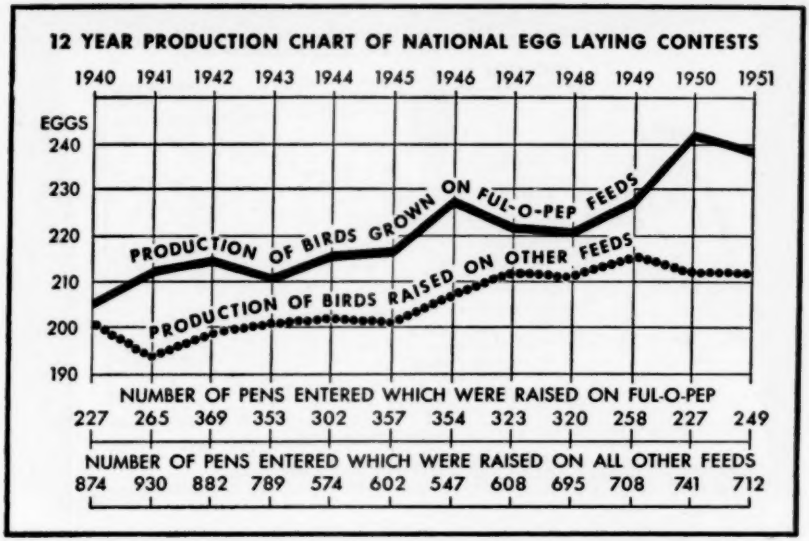
Numerous other published reports by outstanding poultry authorities attest to the effectiveness of Sulfaquinoxaline for both *prevention* or *control* of coccidiosis. An annotated bibliography and detailed literature on the use of Sulfaquinoxaline in feed or drinking water will be sent on request.

Sulfaquinoxaline products are supplied under the labels of various manufacturers in the form of feed mixtures, premixes, solutions, tablets, or soluble powder.

SULFAQUINOXALINE

MERCK & CO., INC.
Manufacturing Chemists
RAHWAY, NEW JERSEY
In Canada: MERCK & CO. Limited—Montreal

National Egg Laying Contests prove FUL-O-PEP GROWS AMERICA'S BEST PULLETS!


12 YEAR PRODUCTION CHART OF NATIONAL EGG LAYING CONTESTS
1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951
EGGS
240
230
220
210
200
190
PRODUCTION OF BIRDS GROWN ON FUL-O-PEP FEEDS
PRODUCTION OF BIRDS RAISED ON OTHER FEEDS
NUMBER OF PENS ENTERED WHICH WERE RAISED ON FUL-O-PEP
227 265 369 353 302 357 354 323 320 258 227 249
NUMBER OF PENS ENTERED WHICH WERE RAISED ON ALL OTHER FEEDS
874 930 882 789 574 602 547 608 695 708 741 712

Birds grown on Ful-O-Pep average laying the equivalent of 15 MORE 2-OZ. EGGS EACH

INFORMATION PRESENTED in the above chart is excellent proof that Ful-O-Pep grows America's Best Pullets.

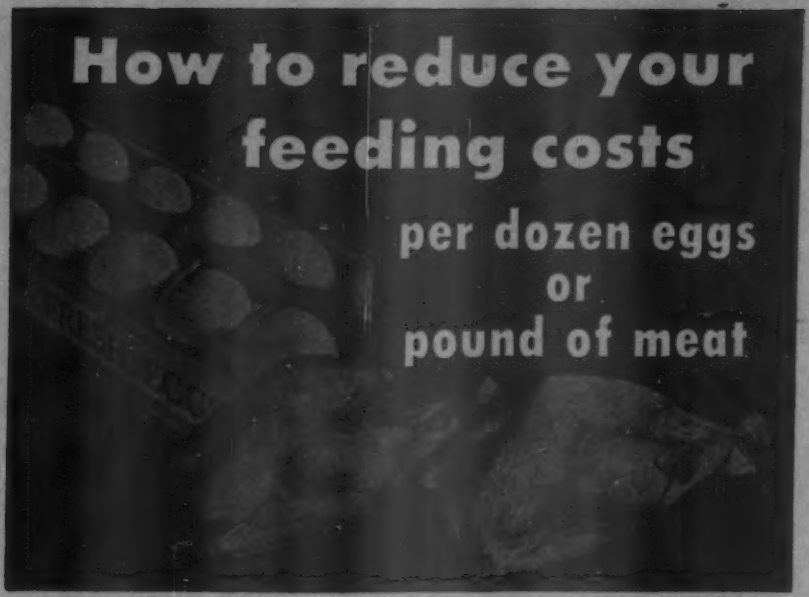
YOU WILL NOTE that for the past 12 years in these official contests 46,852 Ful-O-Pep raised birds averaged laying the equivalent of 15 more 2-oz. eggs each than the average of 112,606 birds grown on all other feeds. And during this time over half of the winning pens and hens were grown on Ful-O-Pep.

IN THE 1951 CONTESTS Ful-O-Pep raised birds averaged laying the equivalent of 24 more 2-oz. eggs each than birds grown on all other brands of feed. Ful-O-Pep feeders also won high pen in 8 and high hen in 7 of the 15 official tests.

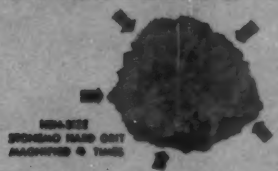
CERTAINLY THIS SUPERIOR egg production is outstanding proof that Ful-O-Pep Research is building better feeds. Best of all, the Ful-O-Pep Restricted Feeding Plan saves poultrymen up to 30% feed cost for growing pullets . . . the kind of birds that produce well and stand up under the strain of heavy, continuous laying.

THE QUAKER OATS COMPANY

. . . makers of dependable feeds for over 60 years



STONEMO'S EXTRA GRINDING SURFACES



help your feeds

do more work at less cost!

Tests show that hens lay as much as 7% more eggs with 6.3% less feed—broilers average a feed efficiency *increase* of 5 pounds of meat per 100 pounds of feed—when insoluble grit is included in their feeding programs.

Poultrymen everywhere are profiting handsomely from such results. That's why they insist upon STONEMO insoluble grit as part of all their feeding programs to *grind out more eggs or meat from every pound of feed.*

STONEMO's *extra grinding surfaces* grind out more value from the nutrients in the birds' feed—help make these nutrients more usable for better egg production and faster growth. STONEMO saves costly feed—gives you bigger profits at market time.

Insist upon STONEMO, the hard insoluble grit, to grind out bigger profits for you. Ask for STONEMO at your local feed or poultry supply dealer. Remember STONEMO's cost is small—its savings large.

STONE MOUNTAIN GRIT COMPANY

Executive Offices & Quarry, LITHONIA, GEORGIA

Branch Quarry, BARRE, VT.